

## “Childhood Cancer a Big Burden of Low Middle Income Settings in Bangladesh: Evidence From Cross Sectional Study Dhaka, Bangladesh”

Dr. Nilufar Akhtar Banu Choudhury<sup>1</sup>, Dr. Md. Selimuzzaman<sup>2</sup>, Dr. Md. Belayet Hossain<sup>3</sup>, Dr. Abdul Wohab<sup>4</sup>

<sup>1</sup> Registrar, Paediatric Hematology-oncology Department, Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

<sup>2</sup> Prof. & Head of Department, Paediatric Hematology-oncology, Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

<sup>3</sup> Associate Professor, Hematology-oncology Department, Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

<sup>4</sup> Medical Officer, Paediatric Hematology-oncology Department, Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

Corresponding author: Dr. Nilufar Akhtar Banu Choudhury

---

### Abstract

**Background:** Cancer is big burden among children and adolescents are largely unknown in Bangladesh. This study aims to provide a comprehensive overview on childhood and adolescent cancers and to contribute to the future strategies to deal with these diseases in Bangladesh. Childhood Cancer is the leading cause of disease related death among children and adolescents. **Literature Review:** The prognosis of malignancy in children depends primarily on two type extent of disease at diagnosis and rapidly on response to treatment. Childhood Cancer is the leading cause of disease related death among children and adolescents. Leukemias, which are cancers of the bone marrow and blood, are the most common childhood cancers. They account for about 31% of all cancers in children. The most common types in children are acute lymphocytic leukemia (ALL) and acute myelogenous leukemia (AML). Leukemia may cause bone and joint pain, fatigue, weakness, pale skin, bleeding or bruising. The prognosis of malignancy in children depends primarily on two type extent of disease at diagnosis and rapidly on response to treatment. **Methods:** Data on malignant neoplasm's in patients aged less than 20 years diagnosed between 2001 and 2014 (N = 3143) in Bangladesh was collected by the National Institute of Cancer Research and Hospital and ASHIC Foundation. The age pattern and distribution of cancer types were analysed and the incidence rates were calculated. **Results:** The age-standardized incidence rate was 7.8 per million person-years for children (0–14 years) in the last time period (2011–2014). Retinoblastoma (25 %) and leukaemia (18 %) were the most common childhood cancers. For adolescents (15–19 years), the age-specific incidence rate was 2.1 per million person-years in the same time period. Most common adolescent cancers were malignant bone tumours (38 %), germ cell and gonadal tumours (17 %), and epithelial tumours (16 %). There were more boys affected (M: F ratio 2.0 in children and 1.4 in adolescents) than girls. **Conclusion:** Cancer incidences were lower than expected most likely due to a low level of awareness about cancer among clinicians and the population, inadequate access to health care, lack of diagnostic equipment and incomplete recording of cases. Improvements on different levels should be made to get a better epidemiologic insight and to detect cancer earlier resulting in a better outcome for affected children and adolescents.

**Keywords:** Bangladesh, Cancer, Childhood, Adolescent, Leukaemia, ALL, Retinoblastoma, Incidence.

\*Corresponding contributor: Dr. Nilufar Akhtar Banu Choudhury.

---

Date of Submission: 10-05-2019

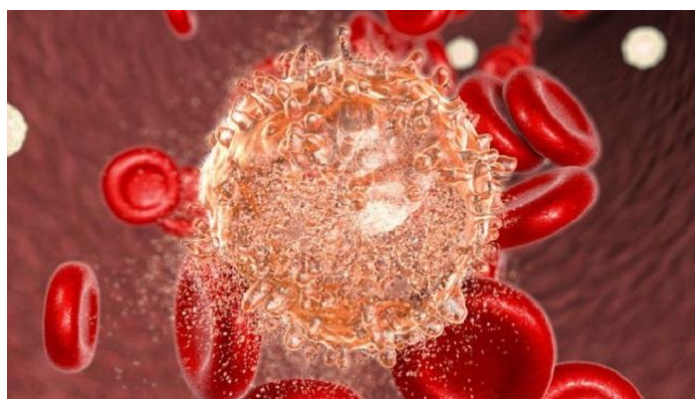
Date of acceptance: 27-05-2019

---

### I. Introduction

Childhood Cancer is the leading cause of disease related death among children and adolescents. The prognosis of malignancy in children depends primarily on two type extent of disease at diagnosis and rapidly on response to treatment. Early diagnosis helps to ensure appropriate therapy is given in a timely fashion and hence optimizes the chances of cure. Objective was to find out the pattern and socio-economic factors of childhood malignancy. It was a cross-sectional study and conducted at pediatric haematology oncology department, Dhaka Shishu (Children) Hospital. Childhood cancers are neglected in developing countries, even though approximately 84 % of the cancer cases under 15 years old occur in the low-income and middle-income

countries (LMICs) [1]. Because of decreased infant mortality rates in developing countries resulting from better management of infectious diseases and current population growth, the number of childhood cancer is expected to increase by 30 % by 2020 [2]. Due to the diversity and scarcity of childhood cancer cases, conducting any epidemiological surveillance is often challenging, especially for LMICs. For these countries, where approximately 83 % of the world population is living, very limited basic epidemiological information is available [1]. The lack of basic epidemiological information on childhood malignancies hinders the understanding of the spectrum of childhood malignancies and also the efforts to set up cancer control strategies, to improve cancer care and the clinical outcomes for affected children in these countries. In Bangladesh, the overall cancer burden including adolescent and childhood cancer is largely unknown due to the nonexistence of (population-based) cancer registries [3, 4]. The proportion of childhood cancers is expected to be high in Bangladesh because of the young population structure- about 30 % (47.4 million) of the population is under 15 years old [5]. Based on the estimated childhood cancer incidence (<15 years) of LMICs and India (102 and 124 per million person-years respectively), 5500–6700 new cases are expected each year [6, 7]. The number of pediatric cancer cases is expected to increase since Bangladesh has significantly reduced the childhood mortality rate by 71 % compared to 1990s due to better management of infectious diseases [8]. For the whole country there are only four main public hospitals (two recently introduced), which are specialized in pediatric oncology. The overall healthcare system including cancer diagnosis, treatment and management encounters severe shortage of infrastructure and trained health manpower [3]. Approximately 500 hospital beds are currently dedicated for cancer patients (both adult and children) in Bangladesh [9] and only fifteen trained pediatric hematologists/oncologists for dealing with pediatric cancers [personal communication]. This study aims to provide a comprehensive recent overview on childhood and adolescent cancers in Bangladesh, which would contribute to the understanding of epidemiologic characteristics and provide a basis for the future strategies to deal with child-hood and adolescent cancers.



Source: Google

## II. Literature Review:

Leukemias, that square measure cancers of the bone marrow and blood, square measure the foremost common childhood cancers. They account for regarding 31% of all cancers in kids. the foremost common sorts in kids arc acute leukaemia (ALL) and acute myelogenousleukemia (AML).Leukemia might cause bone and joint pain, fatigue, weakness, pale skin, trauma or bruising, fever, weight loss, and different symptoms (Armstrong, G.T. 2014). Cancer of the blood is that the commonest childhood cancer, account for regarding one third of medicine malignancies. It's a heterogeneous cluster of malady. It represents malignant transformation of marrow, peripheral animal tissue or thymic cells. These cells square measure inactive at a specific purpose of differentiation, and square measure underneath to attain a lot of mature type. Brain and central systemanervosum tumors square measure the second commonest cancers in kids, creating up regarding twenty first of childhood cancers. There square measure many varieties of brain tumors and also the treatment and outlook for ever is completely different (Cardis, E. 2007). Most brain tumors in kids begin within the lower components of the brain, like the neural structure or brain stem. They will cause headaches, nausea, vomiting, blurred or diplopia, dizziness, and hassle walking or handling objects. Adults square measure a lot of seemingly to develop tumors in higher components of the brain. Neural structure tumors square measure less common than brain tumors in each kids and adults. (Bleyer, A.2008). Metastatic tumor starts in early types of nerve cells found during a developing embryo or vertebrate. Regarding seven-membered of childhood cancers square measure neuroblastomas this sort of cancer happens in infants and young children. It's seldom found in kids older than ten. This neoplasm will begin anyplace however is sometimes within the belly (abdomen) and is noticed as swelling. It can even cause bone pain and fever (Boyd, C. 1999). This sort of willcer can begin within the head and neck, groin, belly (abdomen), pelvis, or in associate degree arm or leg it's going to cause pain,

swelling (a lump), or both this is often the foremost common sort of soft tissue cancer in children. It makes up regarding three-dimensional of childhood cancers. Malignant neoplasm may be a cancer of the attention. It accounts for regarding three-dimensional of childhood cancers. It always happens in kids round the age of two. And is rarely found in Children older than 6. Retinoblastomas square measure sometimes found as a result of a parent or doctor notices a child's eye appearance uncommon unremarkably after you shine a light-weight during a child's eye, the pupil (the dark spot within the center of the attention) appearance red attributable to the blood in vessels within the back of the eye. In an eye fixed with metastatic tumor, the pupil usually appearance white or pink. (Ross, J.A. 2005) Primary bone cancers (cancers that begin within the bones) occur most frequently in older youngsters and teenagers, however they will develop at any age. They account for regarding four-dimensional of childhood cancers (Howlader, N. 2014). Primary bone cancer is completely different from pathologic process bone cancer, that is cancer that started in other places within the body and has unfolded to the bone, pathologic process bone willcer is additional common than primary bone cancer as a result of many varieties of cancer (including several cancers in adults) can unfold to the bone. The causes of most childhood cancers don't seem to be renowned. regarding 5% of all cancers in youngsters are caused by Associate in Nursing hereditary mutation (a chromosomal mutation which will be passed from oldsters to their children). For example, 25 to 30% of cases of metastatic tumor, a cancer of the attention that develops principally in youngsters, are caused by Associate in Nursing hereditary mutation during a factor known as RB1. However, metastatic tumor accounts for under regarding 3% of all cancers in youngsters hereditary mutations related to bound familial syndromes, like Li-Fraumeni syndrome, Beckwith-Wiedemann syndrome, Fanconianemia syndrome. Noonan syndrome, and von Hippel-Lindau syndrome, conjointly will increase the danger of childhood cancer (Bleyer, A. 2008). Genetic mutations that cause cancer may also arise throughout the event of a craniate within the female internal reproductive organ as an example, one in each one hundred youngsters is boom with a genetic defect that will increase risk for leukaemia, though just one kid in eight,000 therewith abnormality really develops leukaemia (Howlader, N. 2014). youngsters United Nations agency have mongolianism, a genetic condition caused by the presence of an additional copy of body twenty one, are ten to twenty times additional possible to develop leukaemia than youngsters while not mongolianism. However, solely an awfully little proportion of childhood leukaemia is connected to mongolianism (Belson, M. 2007).

### **III. Methods**

Data on malignant neoplasm's in patients aged however twenty years recent diagnosed between 2001 and 2014 in Asian nation were collected by the National Institute of Cancer analysis and Hospital (NICRH) and thus the ASHIC (A shelter for helpless unwell children), a Foundation for child-hood cancer. Note that, the ASHIC Foundation started registering childhood cancer cases since 2001. The medicine medicine department of the NICRH was introduced in 2008. Before that, childhood cancer patients were treated beneath medical medicine department at NICRH conjointly as different public and private hospitals. They provide housing throughout treatment, follow-ups in urban center city, palliative care service and psychological direction support [10]. This support is very necessary as a results of most parents face vast difficulties once their child is diagnosed with cancer for instance, these embody travel costs, managing accommodation in urban center city and high treatment costs. The ASHIC Foundation collectively registers childhood cancer cases for specialised tertiary level hospitals outside of urban center city. it's a necessity to mention here that Asian nation is also a lower middle-income country with a population of over 100 sixty million [5], where roughly seventy 2 you take care of the voters board the resource-limited areas, but cancer care facilities unit set at intervals the huge cities, primarily in urban center, the capital. There's no organized referral system in Asian nation. Typically native practitioners counsel the parents to bring their kids to the specialised centre for higher treatment. However, in most cases, parents decide themselves to visit the specialists of the specialised centers once native practitioners could not manage the patients properly. Clinical observations and anatomy examinations were the premise of designation for all collected cancer cases. Blood counts, peripheral blood films and bone marrow aspiration were used for the morphological designation of cancer. Node biopsies were accustomed diagnose lymphomas. Fine needle aspiration biology or tissue biopsies were used for solid tumors. All cases were classified to keep with the International Classification of Childhood Cancer (ICCC) [11]. Results were provided for all neoplasm's combined conjointly for the foremost twelve ICCC diagnostic groups and thus the happiness subgroups for two age groups (0–14 and 15–19 years). The whole study quantity was divided into three time periods supported the quantity of collected cases: 2001–2006, 2007–2010, and 2011–2014.

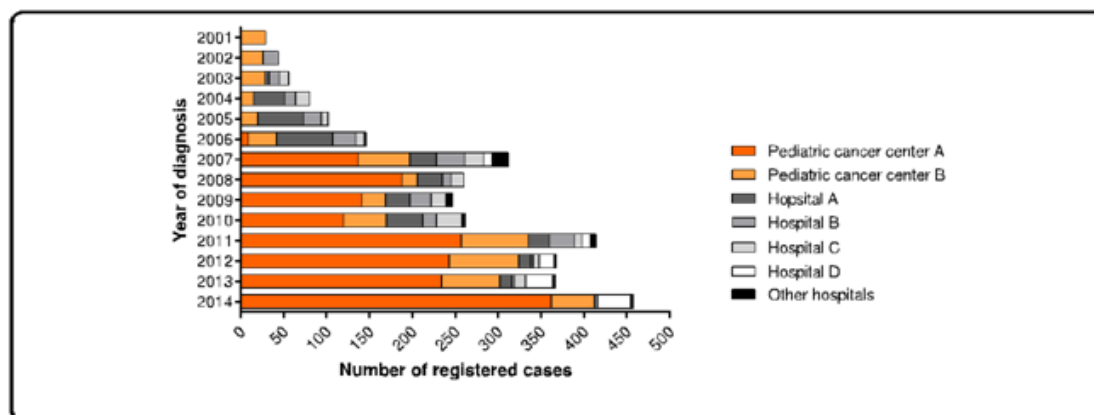
#### **Data quality**

Due to the dearth of systematic and effective recording systems of medical records in public hospitals, duplicated and re-enrolled cases were very expected. A patient might have visited the same hospital or all totally different hospitals again and again. Such duplicates were excluded for the analysis supported the next variables: name, gender, age at admission, year of initial admission, kind of cancer diagnosed and geographic location in

Asian country (e.g., home district of the patient). Out of 3778 cases collected, 635 cases were duplicates (16.8 % of all collected cases). Inside the ultimate dataset, 3143 cases were b where NIRCH and ASHIC Foundation contrib-uted1, 690 and 1453 cases severally. Patients registered by the ASHIC Foundation were diagnosed in twenty all totally different tertiary hospitals mostly placed in capital of Bangladesh, except two hospitals outside of capital of Bangladesh city. Most cases (72 %) were derived from the two main specialized drugs medical science centers in capital of Bangladesh (Fig. 1) and were primarily diagnosed in children aged beneath fifteen years (93 %). data improvement and validation were performed by seven researchers, two drugs oncologists, one man of science and one statistician. The study protocol was ethically approved by the ethical Review Committee (ERC) of National Institute of Cancer analysis and Hospital (this is that the alone state-run specialised cancer hospital in Bangladesh) beneath the official memoranda no. NICRH/Ethics/2013/104. Our retrospective study was supported anamnesis and so, the matter of in-formed consent was waived by ERC of NICRH.

### Statistical analyses

Distribution of the twelve main ICCC diagnostic groups was given for the three study periods simply just in case of adolescent Cancers, data was on the market from 2007. Because of this limitation, we've got an inclination to thought-about two001–2006 as a result of the initial measure for youths and continuing with 2 ulterior equal time periods (2007–2010 and 2011–2014) for childhood and adolescent cancers. The incidence rates were calculated as a result of the common annual style of cases per million person-years [12]. For the population at risk the common of determinable population numbers from 2000 to 2005 was taken for the first study quantity 2001–2006, 2005 and 2010 for 2007–2010, and 2010 and 2015 for the last study quantity 2011–2014 [5]. Weights of the earth traditional population were accustomed calculate age-standardised rates (ASR) for the people 0–14 years, and age-specific rates (Rate) got for the people 15–19 years. Analyses were performed exploitation SAS software package (SAS system 9.2, SAS Institute, Cary, NC).



**Figure: 1** Distribution of recorded cases by hospitals, 2001–2014.

### IV. Results

A total of 3,143 childhood and adolescent cancer cases were collected over the study amount of 2001–2014 for this retrospective study. The typical variety of collected cases annually varied from seventy six in 2001–2006 to in 2007–2010 and 369 in 2011–2014. The age-standardized incidence rate was seven.8 per million kids and a couple of.1 per million adolescents (Table one) in 2011–2014. The sex quantitative relation (M: F) declined from two.5 in two001–2006 to 2.1 in 2007–2010 and one.9 in 2011–2014. Throughout the primary amount more or less eighty you look after the childhood cancer cases were leukaemias and lymphomas, whereas this was fifty one you tired of 2007–2011 and concerning twenty five you tired of 2011–2014 different giant changes in time were discovered for metastatic tumor, malignant bone tumours, and cell and gonodaltumours (Table 1). Within the latest amount, the foremost common cancer sorts were leukemia, metastatic tumor and malig-nant bone tumours. Acute lymphoblastic leukemia (ALL) was out and away the foremost common kind of leukemia (86 %). half all malignant bone tumours were osteosarcomas whereas forty five it had been Ewing tumours. Lymphomas were the fifth most current kind of childhood cancer, wherever the pro-portion of non-Hodgkin malignant neoplastic disease (59 %) was beyond Hodgkin malignant neoplastic disease (19 %). One fourth of the epithe-lialtumours were cavum carcinomas. Most common cancer sorts among adolescents were lymphomas, malignant bone tumours and cell and endocrine gland tumours in 2007–2010. Largest shifts in 2011–2014 were discovered for lymphomas (–82 %), systemanervosumcentraletumours (+900 %) and malignant bone tumours (+178 %), that semiconductor diode to the subsequent high 3 commonest cancer types:

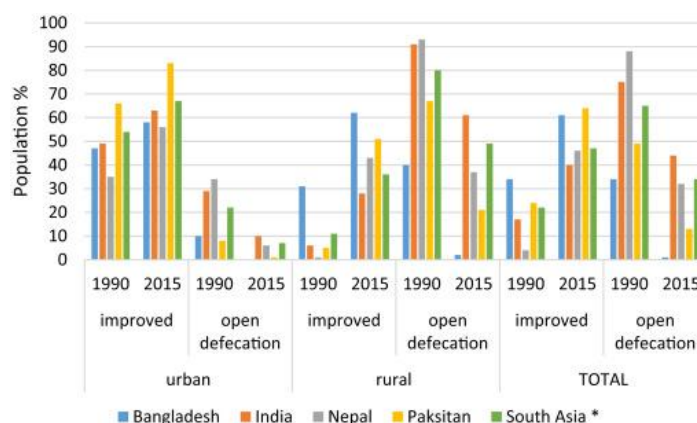
malignant bone tumours, cell and endocrine gland tumours, and animal tissue tumours (Table 2). Osteosarcomas were the foremost current malignant bone growth (68 %). In distinction to the children, cavum carcinomas were less common among adolescents whereas 3 patients were surprisingly diagnosed with metastatic tumor at 15–19 years age bracket. All-time low median age at diagnosing was three years for metastatic tumor, urinary organ tumours and viscuscumours, whereas twelve years for malignant bone tumours metastatic tumor (83 %), Wilms' tumor (67 %) and malignant neoplasm (57 %) preponderantly occurred among kids aged 0–4 years (Fig. 2). Bone tumours (87 %), cell and endocrine gland tumours (44 %), and different animal tissue tumours (64 %) were oftentimes discovered among the older age teams (10–19 years). Leukaemias were principally diagnosed in kids aged 5–9 years (41 %). constant pattern was conjointly observed for ALL while acute myeloid leukemia (AML) was additional common among kids aged 10–14 years (45%). Most common cancer types among adolescents were lymphomas, malignant bone tumours and germ cell and gonadal tumours in 2007–2010. Largest shifts in 2011–2014 were observed for lymphomas (–82 %), CNS tumours (+900 %) and malignant bone tumours (+178 %), which led to the following top three most common cancer types: malignant bone tumours, germ cell and gonadal tumours, and epithelial tumours (Table 2). Osteosarcomas were the most prevalent malignant bone tumour (68 %). In contrast to the children, nasopharyngeal carcinomas were less common among adolescents while three patients were surprisingly diagnosed with retinoblastoma at 15–19 years age group. The lowest median age at diagnosis was 3 years for retinoblastoma, renal tumours and hepatic tumours, while 12 years for malignant bone tumours. Retinoblastoma (83 %), nephroblastoma (67 %) and neuroblastoma (57 %) predominantly occurred among children aged 0–4 years (Fig. 2). Bone tumours (87 %), germ cell and gonadal tumours (44 %), and other epithelial tumours (64 %) were frequently observed among the older age groups (10–19 years). Leukaemias were mostly diagnosed in children aged 5–9 years (41 %). The same pattern was also observed for ALL while acute myeloid leukaemia (AML) was more common among children aged 10–14 years (45%).

Figure 3: Adolescents cancer in Bangladesh.

Table 1: Childhood cancer incidence (0–14 years) by period of diagnosis in Bangladesh, 2001–2014.

ICCC diagnostic group	Period of diagnosis											
	2001–2006			2007–2010			2011–2014			M:F ratio		
	N	%	ASR <sup>a</sup>	N	%	ASR <sup>a</sup>	N	%	ASR <sup>a</sup>			
Total	455		2.0	988		5.1	1474		7.8	2.0:1		
I Leukaemia	269	59.1	1.2	264	26.7	1.4	271	18.4	1.4	3.2:1		
ALL	226			212			234					
AML	18			38			29					
II Lymphoma	89	19.6	0.4	237	24.0	1.2	115	7.8	0.6	2.7:1		
Hodgkin lymphoma	7			74			22					
Non-Hodgkin lymphoma	31			121			68					
III CNS tumours	–	–	–	5	0.5	0.03	65	4.4	0.3	1.5:1		
Ependymoma	–			–			15					
Astrocytoma	–			–			16					
Medulloblastoma	–			–			16					
IV Neuroblastoma	17	3.7	0.08	24	2.4	0.1	54	3.7	0.3	1.0:1		
V Retinoblastoma	6	1.3	0.03	74	7.5	0.4	374	25.4	2.1	1.8:1		
VI Renal tumours	27	5.9	0.2	95	9.6	0.5	90	6.1	0.5	2.1:1		
Nephroblastoma	25			87			89					
VII Hepatic tumours	8	1.8	0.04	13	1.3	0.07	29	2.0	0.2	3.8:1		
Hepatoblastoma	8			13			29					
VIII Bone tumours	2	0.4	0.01	60	6.1	0.3	175	11.9	0.9	1.6:1		
Osteosarcoma	1			38			91					
Chondrosarcoma	–			–			4					
Ewing tumour	1			22			79					
IX Soft tissue sarcomas	18	4.0	0.09	45	4.6	0.2	101	6.9	0.5	2.0:1		
Rhabdomyosarcoma	18			34			74					
Fibrosarcoma	–			3			14					
X Germ cell and gonadal tumours	7	1.5	0.03	117	11.8	0.6	125	8.5	0.6	1.2:1		
XI Other epithelial tumours	3	0.7	0.01	36	3.6	0.2	52	3.5	0.3	2.7:1		
Nasopharyngeal carcinoma	1			18			13					
XII Other and unspecified tumours	9	2.0	0.04	18	1.8	0.09	23	1.6	0.1	1.6:1		

<sup>a</sup>ASR: Age standardised rate per 1 million person-years (World Standard Population).



**Figure 3:** Trends in nutritional status of children under 5 years of age in Bangladesh, 1997–2014. Note: 1996–1997 data from [NIPORT et al. \(1997\)](#); 1999–2000 data from [NIPORT et al. \(2001\)](#); 2004, 2007, 2011, and 2014 data from [NIPORT et al. \(2015\)](#).

**Table 2:** Adolescent cancer incidence (15–19 years) by period of diagnosis in Bangladesh, 2001–2014.

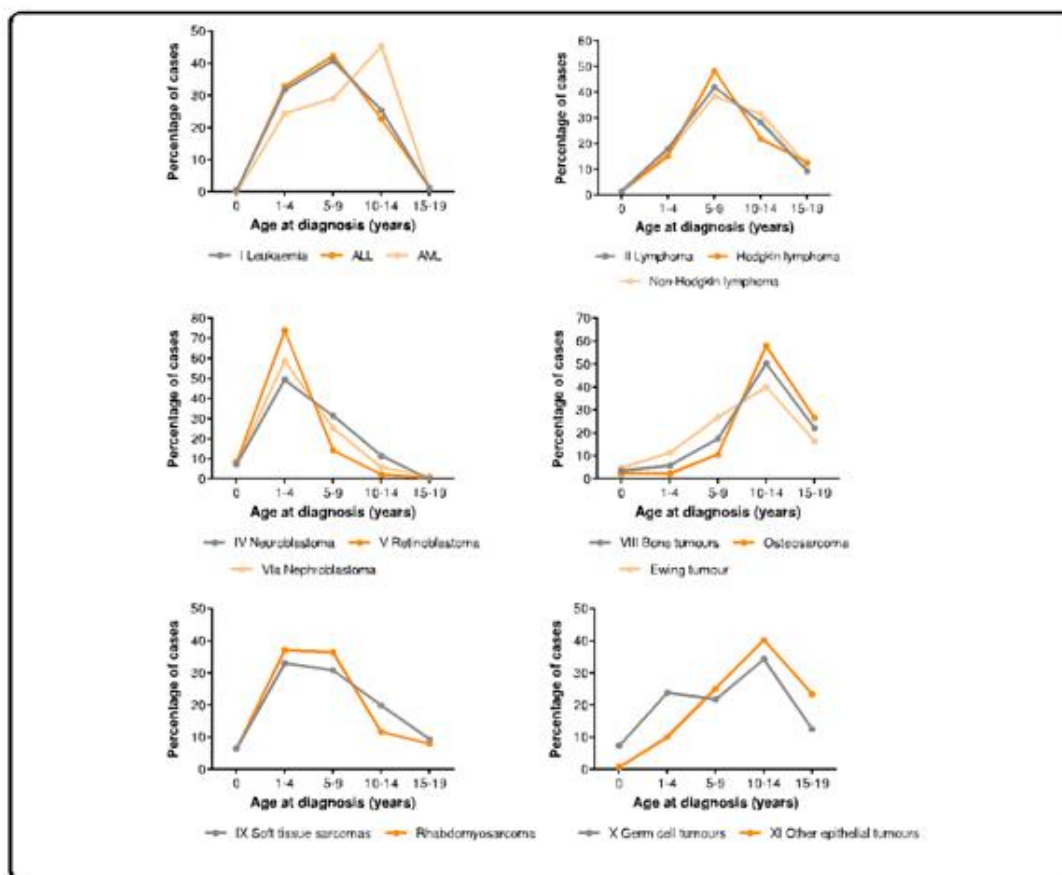
ICCC diagnostic group	Period of diagnosis						
	2007–2010			2011–2014			
	N	%	Rate <sup>a</sup>	N	%	Rate <sup>a</sup>	M:F ratio
Total	93		1.5	133		2.1	1.4:1
I Leukaemia	3	3.2	0.05	6	4.5	0.09	5.0:1
ALL	2			6			
AML	1			–			
II Lymphoma	38	40.9	0.6	7	5.3	0.1	1.3:1
Hodgkin lymphoma	13			2			
Non-Hodgkin lymphoma	25			4			
III CNS tumours	1	1.1	0.02	10	7.5	0.2	2.3:1
Ependymoma	–			–			
Astrocytoma	–			3			
Medulloblastoma	–			5			
IV Neuroblastoma	–			–			
V Retinoblastoma	1	1.1	0.02	2	1.5	0.03	–
VI Renal tumours	3	3.2	0.05	–			
Nephroblastoma	3			–			
VII Hepatic tumours	–			1	0.8	0.02	–
Hepatoblastoma	–			1			
VIII Bone tumours	18	19.4	0.3	50	37.6	0.8	1.9:1
Osteosarcoma	13			34			
Chondrosarcoma	–			1			
Ewing tumour	5			15			
IX Soft tissue sarcomas	6	6.5	0.1	11	8.3	0.2	0.6:1
Rhabdomyosarcoma	5			6			
Fibrosarcoma	–			2			
X Germ cell and gonadal tumours	14	15.1	0.2	22	16.5	0.4	0.4:1
XI Other epithelial tumours	7	7.5	0.1	21	15.8	0.3	4.3:1
Nasopharyngeal carcinoma	4			1			
XII Other and unspecified tumours	2	2.2	0.03	3	2.3	0.05	0.5:1

<sup>a</sup>Rate: Age-specific rate per 1 million person-years

Male predominance could be a common development for several childhood cancers. In developed countries, the sex quantitative relation of boys to ladies is regarding one.1 ~ 1.34 [15], wherever some cancers as well as adenomyosarcoma and malignant tumor typically exhibit slightly feminine preponderance [16]. The general proportion of cancers was a lot of higher in males than females in Bangla Desh. for a few cancers (leukaemias and hepa-toblastoma), the male predominance was noted to be quite 3 times higher among Bangladeshi boys, whereas the sex quantitative relation was nearly equal for malignant neoplasm, and reproductive cell and endocrine tumours. This retrospective study unconcealed that malignant tumor was the



foremost frequent (25 %) childhood cancer in Bangla Dosh in 2011–2014. The numbers of malignant tumor patients area unit typically higher in developing countries as they need high birth rates, like in Asia and continent [17]. Most cases (83 %) occurred in youngsters younger than five years recent (Fig. 2) With a median age of three years. even if it's typically terribly uncommon when the age of 10, we've got noted that regarding 3% you look after all malignant tumor cases were aged between ten and nineteen years. this might flow from to a delayed identification, that is common in developing countries [18, 19]. malignant tumor could be a curable tumor in additional than ninety you look after cases, if it's detected at early stages [20]. As compared to different malignancies, the first signs of malignant tumor area unit simply detectable if health care professionals yet as folk's area unit awake to this malig-nantunwellness. outstandingly for South Asia, the gains are broad based mostly, with progress amongst the poorest in rural communities occurring a lot of quicker than in the other country and for the most part driving the reduction in open excretion (Fig. 3). Per the WHO report, passage cancer – a cancer within the food tract, lidded the list followed by cavity lip and rimaoris cancer, carcinoma, carcinoma and porta cancer amongst the foremost common in Bangladesh.



**Figure 2:** Pattern of age at diagnosis of selected childhood and adolescent cancers in Bangladesh, 2001–2014

A malignant neoplasm education programme in Republic of Honduras has shown to scale back the proportion of advanced stages considerably. However, it absolutely was not productive in rising treatment compliance [21]. Leukaemias were the second commonest childhood malignancy (18 %) in Bangladesh in 2011–2014. However, throughout the full study amount (2001–2014), leukaemias grooved most cases (28 %). The proportion of leukaemias varies across totally different countries starting from twenty seven to thirty five nada [6, 15, 21, 22]. In US, for example, leukaemias account for thirty one you look after all medicine cancers, whereas it's just about thirty seven you bored with Calcutta, a neighboring Indian state and nearly twenty six you bored with Asian country with similar culture and socio-economic structures to Bangladesh [22, 23]. ALL com-prised of the main proportion (84 %) of childhood leukemia (Table 1) between 2001 and 2014. As mentioned earlier concerning under-reporting, a recent population-based study has shown that just about 15–35 you look after ALL cases go unreported [24]. Reasonably, taking of these problems along, the proportion of leukaemias would be significantly abundant higher in Bangladesh than our gift findings. The presenting mean age of leukemia patients in South Asian countries (Bangladesh, Asian nation and Pakistan) was found to be higher (6–7 years) than those of Western countries wherever incidence peak was between zero and four years [16, 25–27]. Curiously, the similar age distribution of leukemia was additionally noted among South Asian

population in United Kingdom [28]. In high-income countries, brain/CNS tumours area unit the second most medicine cancer comprising 20–27 you look after all cases, whereas lymphomas area unit the distant third childhood malignancy [16, 29–31]. However, it's been found that lymphomas were the fifth most often diagnosed cancer (7.8 %) in Bangladeshi kids and system tumours were even a lot of less common (4.4 %), hierarchical eighth among of all childhood cancers. terribly low incidence rates of system tumours in low-income countries as well as Bangladesh area unit doubtless related to the shortage of recent diagnostic facilities [7]. In cases of lymphomas, an analogous pattern was additionally noted in Asian nation and Asian country however the pattern of NHL and HD was opposite to the current study [6, 22]. We tend to ascertained that there was the next proportion of NHL (about 70 %) compared to HD, a pattern almost like developed world. The age distribution was similar for NHL and HD; concerning eighty you look after malignant neoplastic disease cases were diagnosed in children aged 5–14 years with a median age between seven and eight years [Fig. 2]. However, HD is typically rare among children younger than ten years, however one among the foremost common cancers among adolescents (15–19 years) in industrialised countries [16, 32]. Malignant bone tumours were the foremost common form of cancer among adolescents and hierarchical third among childhood cancer with a median age of twelve years. Osteon-sarcoma (58 %) and Ewing malignant neoplastic disease (40 %) were the 2 commonest varieties of malignant bone cancers. The age-specific distribution pattern of {osteosarcoma|osteogenic malignant neoplastic disease|sarcoma} and Ewing sarcoma showed that they were rare before the age of 5 years and therefore the proportion raised with ages throughout childhood; each peaked at the ages of ten to thirteen years. This age pattern resembles therewith of developed countries [16].

## V. Discussion

Best of our data, typically|this can be} often the first medical science study that has an overview on childhood and adolescent cancer in Asian country malignant neoplasm and leukaemias were the foremost common childhood cancers whereas malignant bone tumours, germ cell and endocrine tumours, and tissue tumours were a great deal of common among adolescents. In con-trust, a single-hospital based study (n = 1250) showed that malignant growth unwellness was the foremost common childhood cancer in Bangla Desh [13], whereas another study reportable embryoma of the kidney Wilmstumour being the foremost frequent medical science malignancy (n = 70) [14]. However, the strength of this specific study is that it's collected cases from twenty completely totally different tertiary hospitals then, this study pro-vides associate degree improved illustration of true of childhood cancers in Bangla Desh. Over time, the childhood and adolescent cancer incidence has inflated that's presumptively owing to improved awareness among clinicians, drugs and registration. Hence, the foremost recent quantity (2011–2014) represents the foremost reliable outline tho' the incidence rates unit of measurement still low compared to Republic of Asian country where the total childhood cancer rates varied between thirty eight and 124 per million person-years compared to eight per million person-years in Bangla Desh [6]. Underreporting of malignancies is well-known in resource-limited countries. with the exception of inadequate access to health care, lack of skillful educa-tion, infrastructure (such as advanced diagnostic facilities and imaging devices) and low level of health awareness equally as various socioeconomic factors that end in the under-representation of cancer incidence; the presenting symptoms for some medical science cancers (especially leukaemias) gibe with those of infections. Aggregation medical science data was jointly encountered with giant difficulties owing to lack of degree adequate record keeping system publically hospitals, that it had been impracticable to ascertain e.g., treatment outcomes and survival. Sex-specific variations at intervals the incidence of medical science malignancies unit of measurement consistent globally.

## VI. Conclusion

This is the first study that gives an outline on the distribution of pediatric cancers in Bangladesh. Incidences area unit beneath expected probably because of an occasional level of awareness regarding cancer among clinicians and additionally the population, inadequate access to health care, lack of diagnostic instrumentation and incomplete recording of cases. enhancements on completely totally different levels (e.g., work further pediatricians relating to symptoms of childhood and adolescent cancer, avail-ability of diagnostic instrumentation, sensible documentation of medical data in hospitals) need to be implemented to urge associate degree improved insight into the dimensions of this ‘health problem’ and to sight cancer earlier, that is ready to anon finish in associate degree improved outcome for affected kids and adolescents.

## Acknowledgement

We acknowledge the Paediatric Hematology and Oncology Department, parents who had given consent, the authority of the Dhaka shishu (Children) hospital and the Data collection team who has collected data successfully.



## Abbreviations

ALL: acute lymphoblastic leukaemia; AML: acute myeloid leukaemia;  
CNS: central nervous system; HD: Hodgkin’s disease; NHL: Non-Hodgkin  
Lymphoma; NICRH: National Institute of Cancer Research and Hospital.

**Competing interests:**The authors declare that they have no competing interests.

## References

- [1]. Magrath I, Steliarova-Foucher E, Epelman S, Ribeiro RC, Harif M, Li CK, Kebudi R, Macfarlane SD, Howard SC. Paediatric cancer in low-income and middle-income countries. *Lancet Oncol.* 2013; 14(3):e104–16.
- [2]. Rodriguez-Galindo C, Friedrich P, Morrissey L, Frazier L. Global challenges in pediatric oncology. *Curr Opin Pediatr.* 2013; 25(1):3–15.
- [3]. Hossain MS, Ferdous S, Karim-Kos HE. Breast cancer in South Asia: a Bangladeshi perspective. *Cancer Epidemiol.* 2014; 38(5):465–70.
- [4]. Hossain MS, Iqbal MS, Khan MA, Rabbani MG, Khatun H, Munira S, Miah MM, Kabir AL, Islam N, Dipta TF et al. Diagnosed hematological malignancies in Bangladesh - a retrospective analysis of over 5000 cases from 10 specialized hospitals. *BMC Cancer.* 2014; 14:438.
- [5]. World Population Prospects. 2015 Revision: <http://esa.un.org/unpd/wpp/Download/Standard/Population/>. Accessed 14 Feb 2016.
- [6]. Arora RS, Eden TO, Kapoor G. Epidemiology of childhood cancer in India. *Indian J Cancer.* 2009; 46(4):264–73.
- [7]. Howard SC, Metzger ML, Wilimas JA, Quintana Y, Pui CH, Robison LL, Ribeiro RC. Childhood cancer epidemiology in low-income countries. *Cancer.* 2008; 112(3):461–72.
- [8]. World Bank. <http://data.worldbank.org/indicator/SH.DYN.MORT>. Accessed 14 Feb 2016.
- [9]. Hussain SA, Sullivan R. Cancer control in Bangladesh. *Jpn J Clin Oncol.* 2013; 43(12):1159–69.
- [10]. Islam A, Eden T. Brief report on pediatric oncology in Bangladesh. *South Asian J Cancer.* 2013; 2(2):105–6.
- [11]. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International classification of childhood cancer, third edition. *Cancer.* 2005; 103(7):1457–67.
- [12]. Boyle D, Parkin DM. Statistical methods for registries. In: *Cancer Registration: principles and methods.* International Agency for Research on Cancer publication no.95. 1991. <https://www.iarc.fr/en/publications/pdfs-online/epi/sp95/sp95-chap11.pdf>. Accessed 14 Feb 2016.
- [14]. Jabeen S, Haque M, Islam MJ, Talikder MH. Profile of paediatric malignancies: a five year study. *J Dhaka Med Coll.* 2010; 19:33–8.
- [15]. Hasan GZ, Hossain AKMZ, Amin MR, Siddiqui MTH, Islam KMD. Pattern of childhood malignant tumour in the Paediatric Surgery Department of Bangabandhu Sheikh Mujib Medical University. *BSMMU J.* 2011; 4:99–101.
- [17]. Bhopal SS, Mann KD, Pearce MS. Registration of cancer in girls remains lower than expected in countries with low/middle incomes and low female education rates. *Br J Cancer.* 2012; 107(1):183–8.
- [18]. Ward E, DeSantis C, Robbins A, and Kohler B, Jemal A. Childhood and adolescent cancer statistics, 2014. *CA Cancer J Clin.* 2014; 64(2):83–103.
- [19]. Dimaras H, Kimani K, Dimba EA, Gronsdahl P, White A, Chan HS, Gallie BL. Retinoblastoma. *Lancet.* 2012; 379(9824):1436–46.
- [20]. Chantada G, Fandino A, Manzitti J, Urrutia L, Schwartzman E. Late diagnosis of retinoblastoma in a developing country. *Arch Dis Child.* 1999; 80(2):171–4.
- [21]. Rodrigues KE, Latorre Mdo R, de Camargo B. Delayed diagnosis in retinoblastoma. *J Pediatr (Rio J).* 2004; 80(6):511–6.
- [22]. Abramson DH, Beaverson K, Sangani P, Vora RA, Lee TC, Hochberg HM, Kirsztrot J, Ranjithan M. Screening for retinoblastoma: presenting signs as prognosticators of patient and ocular survival. *Pediatrics.* 2003; 112(6 Pt 1):1248–55.
- [23]. Leander C, Fu LC, Pena A, Howard SC, Rodriguez-Galindo C, Wilimas JA, Ribeiro RC, Haik B. Impact of an education program on late diagnosis of retinoblastoma in Honduras. *Pediatr Blood Cancer.* 2007; 49(6):817–9.
- [24]. Badar F, Mahmood S, Zaidi A, Bhurgri Y. Age-standardized incidence rates for childhood cancers at a cancer hospital in a developing country. *Asian Pac J Cancer Prev.* 2009; 10(5):753–8.
- [25]. Datta K, Choudhuri M, Guha S, Biswas J. Childhood cancer burden in part of eastern India—Population Based Cancer Registry data for Kolkata (1997–2004). *Asian Pac J Cancer Prev.* 2011; 11(5):1283–8.
- [26]. Azevedo-Silva F, Reis Rde S, Santos Mde O, Luiz RR, Pombro-de-Oliveira MS. Evaluation of childhood acute leukemia incidence and underreporting in Brazil by capture-recapture methodology. *Cancer Epidemiol.* 2009; 33(6):403–5.
- [27]. Bajel A, George B, Mathews V, Viswabandya A, Kavitha ML, Srivastava A, Chandy M. Treatment of children with acute lymphoblastic leukemia in India using a BFM protocol. *Pediatr Blood Cancer.* 2008; 51(5):621–5.
- [28]. Fadoo Z, Nisar I, Yousuf F, Lakhani LS, Ashraf S, Imam U, Zaheer J, Naqvi A, Belgaumi A. Clinical features and induction outcome of childhood acute lymphoblastic leukemia in a lower/middle income population: a multi-institutional report from Pakistan. *Pediatr Blood Cancer.* 2015; 62(10):1700–8.
- [29]. Sazawal S, Gurbuxani S, Bhatia K, Khattar A, Raina V, Arya LS, Vats T, Magrath I, Bhargava M. Incidence, clinical characteristics and early treatment outcome in Indian patients of childhood acute lymphoblastic leukemia with ALL-1 gene rearrangement. *Leuk Res.* 2001; 25(8):693–8.
- [30]. McKinney PA, Feltbower RG, Parslow RC, Lewis IJ, Glaser AW, Kinsey SE. Patterns of childhood cancer by ethnic group in Bradford, UK 1974–1997. *Eur J Cancer.* 2003; 39(1):92–7.
- [31]. Baade PD, Youlten DR, Valery PC, Hassall T, Ward L, Green AC, Aitken JF. Trends in incidence of childhood cancer in Australia, 1983–2006. *Br J Cancer.* 2007; 102(3):620–6.
- [32]. Hung GY, Horng JL, Lee YS, Yen HJ, Chen CC, Lee CY. Cancer incidence patterns among children and adolescents in Taiwan from 1995 to 2009: a population-based study. *Cancer.* 2014; 120(22):3545–53.
- [33]. Kaatsch P, Steliarova-Foucher E, Crocetti E, Magnani C, Spix C, Zamboni P. Time trends of cancer incidence in European children (1978–1997): report from the Automated Childhood Cancer Information System project. *Eur J Cancer.* 2006; 42(13):1961–71.
- [34]. Clavel J, Steliarova-Foucher E, Berger C, Danon S, Valerianova Z. Hodgkin’s disease incidence and survival in European children and adolescents (1978–1997): report from the Automated Cancer Information System project. *Eur J Cancer.* 2006; 42(13):2037–49.
- [35]. 35. Cardis E, Hatch M. 2007 The Chernobyl accident—an epidemiological perspective. *Clinical Oncology: A Journal of the Royal College of Radiologists* - 23(4):251–260.

- [36]. Howlader N, Noone AM, Krapcho M, et al. (eds). April 2014 SEER Cancer Statistics [Review](http://seer.cancer.gov/csr/1975_2011/). 1975-2011, National Cancer Institute. Bethesda, MD, [http://seer.cancer.gov/csr/1975\\_2011/](http://seer.cancer.gov/csr/1975_2011/) , based on November 2013 SEER data submission, posted to the SEER web site,
- [37]. Hossain B, Sharmin S, Banu B, Hoq MS, Khan WA.1995 Clinical and hematological presentation of childhood leukaemia. *PS (Child) HJ*; 11: 1-20.
- [38]. Kurt BA, Armstrong GT, Cash OK, et al 2008, [primary care management of the childhood cancer survivor](#), *J pediatr.*; 152:458-466.
- [39]. 2006-2008. National Registry of Childhood Tumours/Childhood Cancer Research Group.
- [40]. National Cancer policy Board, Institute of Medicine. National Research council of the National Academies; Childhood Cancer. Survivorship: Improving Care and Quality of life. Washington, DC: National Academies press: 2003.
- [41]. 1996-2005. Personal **communication** with Charles Stiller/Childhood Cancer Research Group.
- [42]. Popov SD, Sebire J, Pritchard-Jones K, Vujanac GM. 2011 Renal tumors in children aged 10-16 Years: a report from the United Kingdom Children's Cancer and I, eukaemia Group. *Pediatric and Developmental Pathology*.14 (3): 189-193.
- [43]. Ram R, Wolach O, Vidal L, et al. 2012 Adolescents and young adults with acute lymphoblastic leukemia have a better outcome when treated with pediatric-inspired regimens: Systematic review and meta-analysis. *American Journal of Hematology*, 87(5):472-478.

Dr. Nilufar Akhtar Banu Choudhury. “Childhood Cancer a Big Burden of Low Middle Income Settings in Bangladesh: Evidence From Cross Sectional Study Dhaka, Bangladesh”. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 5, 2019, pp 52-61.