DEMOGRAPHIC AND EPIDEMIOLOGIC PROFILE OF TUMOURS IN CHILDREN IN A TERTIARY PAEDIATRIC SURGERY CENTRE IN BANGLADESH

Mohammad Minhajuddin Sajid[1*] Tanvir Kabir Chowdhury[2] Md. Abdullah Al Farooq[1]
M A Mushfiqur Rahman[2] Mohammad Zonaid Chowdhury[3]

Abstract

Background : The real demographic and epidemiologic profile of cancer in paediatric age group in Bangladesh is not known. The aim of this study is to provide a comprehensive recent knowledge of paediatric cancer in Bangladesh.

Materials and methods: We retrospectively reviewed records of all tumours admitted in the Department of Paediatric Surgery, Chittagong Medical College Hospital from January 2009 to December 2019 (11 years). Data were collected with regards to type of tumour, age, sex, frequency and age group specific distribution.

Results: There was a total of 131 patients. Male to female ratio was 1.29:1. Age ranged from 27 days to 14 years (Median 4 years). 75 patients were in 0-4 years, 38 in 5-9 years and 18 in 10-14 years age group. Nephroblastoma was the commonest tumour (32) followed by Neuroblastoma (16) and Sacrococcygeal teratoma (11).

Conclusion: There was a wide variation of tumour occurrence among age groups and between sexes. Cancer registry is needed for proper data recording of the cases.

Key words: Paediatric; Cancer; Tumour; Demography; Epidemiology.

Introduction

The current estimated population of Bangladesh in 2020 is 164,689,383 at midyear according to the UN data and approximately, 26.75% of the population is below 15 years of age. Among all the cancer cases under 15 years of age, 84% occur in the Low- and Middle-Income Countries (LMICs).[1] The estimated incidence of 12.7 million new cancer cases in 2008 will rise to 21.4 million by 2030.[2] Presently, about 13 to 15 lac cancer patients were there in Bangladesh to which 2 lac patients were added each year.[3] The increasing load of cancer patients were owing mainly to increase in the population, with decreased mortality and increased survivals of the children due to our EPI schedule, increased awareness of the parents, clinicians and society about cancer, increased and more developed techniques and facilities for diagnosis and treatment, increased knowledge, skill and care of our physicians about cancer and proper registration. In Bangladesh, the statistics about paediatric cancer population is enigmatic owing to the absence of a population-based cancer registry.[4,5] In India, the incidence of cancer is 64 per million in less than 15-year-old children and in Pakistan, it is 100 per million.[6] Using worldwide cancer incidence of 180 per million children, every year 13,000 new cases were added to the paediatric cancer population in Bangladesh and only a quarter of these children come to the notice.[7,1] To handle this load of patient we have to prepare ourselves by extending the services of preventive and curative measures.

The incidence rate of cancer in Bangladesh is 8 per million person-years compared to the rates of 38 to 124 per million person-years in India.[8] The estimated childhood cancer incidence (< 15 years) of LMICs and India is 102 and 124 per million person-years respectively and 5500-6700 new cases were apprehended each year.[9] Since Bangladesh has significantly reduced the childhood mortality rate by 71% compared to 1990s owing to better management of infectious diseases, the number of paediatric cancer patients is fewer to increase in the coming years.[6] In Bangladesh, paediatric oncological and onco-surgical services were rendered by Bangabandhu Sheikh Mujib Medical University (BSMMU) nine (9) Public Medical College Hospitals and National Institute of Cancer Research and Hospital (NICRH) which own paediatric oncology and paediatric onco-surgery facilities. Besides that, few private institutes and (Bangladesh Institute of Child Health and Dhaka Shishu Hospital-BICH-DSH) hospitals (Khaza Yunus Ali Medical College and Hospital, Ahsania

1. Associate Professor of Paediatric Surgery
Chittagong Medical College, Chattogram.
2. Assistant Professor of Paediatric Surgery
Chittagong Medical College, Chattogram.
3. Assistant Registrar of Paediatric Surgery
Chattogram Medical College Hospital, Chattogram.

***Correspondence:** **Dr. Md. Minhajuddin Sajid**
E-mail: minhajsajid@gmail.com
Cell : 01911 81 14 21

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Mission Cancer Hospital) provide the facility of cancer treatment both in medical and surgical sides. But overall healthcare facility including cancer diagnosis, investigation, management and treatment encounters acute shortage of financial backup, infrastructural weakness, and lack of trained or expert manpower facility and shortage of staff.[10,4] Approximately 500 beds were dedicated for cancer patients (Both adults and children) in Bangladesh and only fifteen trained and certified paediatric oncologists and paediatric oncosurgeons were serving the cancer patients (Personal communication).[11] The aim of this study is to provide a comprehensive recent knowledge of paediatric cancer in Bangladesh which would help our understanding of epidemiologic characteristic and demographic profile of paediatric cancer and provide knowledge for future strategies to deal with them.

Materials and methods

This was a retrospective study carried out in the Department of Paediatric Surgery, Chittagong Medical College Hospital (CMCH) which is a tertiary academic hospital in the second largest city in Bangladesh and also is the largest referral centre for paediatric surgical services for about one fifth of the population of the country. All children who were admitted with a diagnosis of any kind of neoplasm between January 2009 and December 2019 (11 years) were included in this study. Patients in whom the records were not found were excluded from the study. The general objective of the study was to describe the epidemiologic characteristics of paediatric tumour patients in this hospital during this period. The specific objectives were to gather data on age, sex, frequency and type of tumours. A total of 138 patients' files were available for analysis during the study period (2009 to 2019). Moreover, patients who were initially admitted in our department but after diagnosis or surgery were referred to other departments for chemotherapy or other reasons and discharged from those departments could not be included in this study as their records could not be found. Complied data were coded in unique alphanumeric codes for each variable and subjected to statistical analysis using both Microsoft Excel 2019 and SPSS version 22 and cross checked to correct errors. Categorical variables were described as frequency and percentage. Continuous variables were expressed as mean or median ± standard deviation. Confidentiality was maintained using unique identifiers and by password protected data entry software with restricted users. The data so obtained were compared with the cancer registry of various institutions of Bangladesh, India and USA.

Results

Among the 138 patients, 76 were male and 59 were female (Ratio 1.29:1). However, excluding the tumours of the gonads of the specific sex, the total number of male patients with tumours was 73 while the number of female patients with tumours was 57 (Ratio 1.28:1). Age ranged from 26 days to 14 years (Median 4 years, mean 4.76 ± 3.68 years). Figure 1 shows the age group specific distribution of tumour patients.

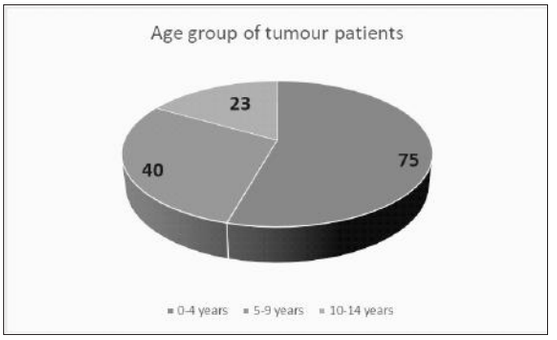

Fig 1 : Age group specific distribution of paediatric tumour patients (n=138).

Nephroblastoma was the commonest (32) tumour among both males (16) and females (16). It was commonest (24) in the age group 0~4 years completed followed by 8 cases in the 5~9 years completed. The next commonest tumour was Neuroblastoma (16). All cases of SCT were female with 10 cases within the age group 0~4 years completed and only 1 case in the age group of 5~9 years. Table 1 demonstrates the list of all tumours and their sex distribution.

Table 1: Frequency of tumours with sex distribution.

Sl No	Name of tumour	Total	Male: Female
1	Nephroblastoma	32	1:1
2	Neuroblastoma	16	2.2:1
3	Sacrococcygeal Teratoma	11	0:11
4	Rhabdomyosarcoma	11	2.7:1
5	Primary Neuro-Ectoderm Tumour	10	1:1

6	Colorectal carcinoma	9	2:1
7	Retroperitoneal Pelvic Lymphoma/Hodgkin's Lymphoma	8	7:1
8	Lipoma	6	2:1
9	Hepatoblastoma	5	4:1
10	Non-Hodgkin's Lymphoma	4	3:1
11	Retroperitoneal Teratoma	3	1:2
12	Malignant Fibrous Histiocytoma	3	2:1
13	Neurofibroma	2	0:2
14	Pre-Sacral Dermoid Cyst/Teratoma	2	2:0
15	Hepatic Teratoma	1	0:1
16	Mesenteric Yolk Sac Tumour	1	0:1
17	Primary Adrenocortical Tumour	1	0:1
18	Squamous Cell Carcinoma of Tongue	1	1:0
19	Metastatic Spindle Cell Sarcoma	1	1:0
20	Benign Mesenchymal Tumour over Scapular Region	1	1:0
21	Synovial Sarcoma over Wrist Joint	1	0:1
22	Infantile Pelvic Fibrosarcoma	1	1:0
23	Non-Seminomatous Testicular tumours		
	i) Embryonal carcinoma (right Testis)	1	NA*
	ii) Yolk Sac tumour (left Testis)	1	NA
24	Seminoma of Testis	1	NA
25	Ovarian Tumours		
	i) Mature Ovarian Teratoma/ Dermoid Cyst	3	NA
	ii) Ovarian Embryonal Carcinoma	1	NA
	iii) Ovarian Carcinoma	1	NA

*NA=Not applicable as tumours occurring only in male or female.

Nephroblastoma was the commonest tumour in both 0~4and 5~9 years age group. Colorectal carcinoma was the commonest tumour in 10~14 years age group. Table II shows the five most common tumours in different age groups.

Table II : Commonest tumours in different age groups.

0-4 years (n=75)			5-9 years (n=40)			10-14 years (n=23)		
Name of tumour	No	%	Name of tumour	No	%	Name of tumour	No	%
Nephroblastoma	24	32%	Nephroblastoma	8	20%	Colorectal carcinoma	7	30%
Neuroblastoma	11	15%	Neuroblastoma	5	13%	PNET	5	22%
SCT	10	13%	HL	4	10%	Ovarian tumours	3	13%
Rhabdomyosarcoma	7	9%	PNET	4	10%	Rhabdomyosarcoma	2	9%
HL	4	5%	NHL	4	10%	Malignant Fibrous Histiocytoma/Lipoma/ Neurofibroma/seminoma/ Synovial sarcoma	1	4%

SCT: Sacrococcygeal Teratoma, HL: Hodgkin's Lymphoma, PNET: Primary Neuroectodermal tumour, NHL: Non-Hodgkin's Lymphoma.

Discussion

Paediatric tumours were not just the miniature variation of the adult tumours but they constitute a special separate domain of tumour with different chromosomal, genetic and environmental factors playing role in the aetiology. The pathophysiology, growth spurt, clinical features, choice of therapy and response to treatment is also different from those of an adult. Although the major cause of childhood mortality in LIC still remains infection and malnutrition, incidence of paediatric cancer and solid tumours is on the rise. In one report from a tertiary hospital in India, paediatric tumours constituted 3.4% of all malignancies, comparable to Indian national data (3.58%). Males were more affected than females (72.6% Vs 27.4%).[12] This result is in match with our study where male patients (76) were more than female patients (59). Most of tumours (75) occurred in the 0~4 age group followed by the age group of 5~9 is years (40). The least common age group affected is 10~12 years (23).

Nephroblastoma/Wilms' tumour was the most common malignancy (24.62%). 24 patients (2/3) were in the age group of 0~4 years of age and 8 patients (1/3) in 5~9 years age group. Male and female occurrence was equal (16:16). It correlates with another study reported in BSMMU, being the most frequent paediatric malignancy[13]. The second most common tumour was Neuroblastoma (12.21%) with more than twice male preponderance (11:5). There were 11 patients in the 0~4 years age group 5 patients in 5~9 years age group. In the study carried out in BSMMU mentioned just before, Neuroblastoma comprised 15.7% of the tumour, the third most commonly occurring tumour[13]. It also matches with our result. In our study, we found Sacrococcygeal Teratoma (11) the 3rd most frequently occurring tumour. All of the patients were female and all but 1 patient were in the 0~4 years age group, only 1 being in 5~9 years age group. It doesn't match with any of the studies done elsewhere in the country or abroad. In BSMMU, there was only 1 case (1.4%) of SCT reported[13].

Rhabdomyosarcoma (11 cases, 7.97%) occurred in urinary bladder, female genitalia or buttock encroaching upon lower limb. In the study carried out in BSMMU, the patients developed the tumour in the lower limbs, so they were treated in Orthopaedics ward.[13] So, this is not in match with our ward. PNET/Ewing's sarcoma of the pelvis (Malignant small round cell tumour) followed (10)

Rhabdomyosarcoma. Although these cases were exceedingly were, in a large series published to date, it usually presented in the second decade of life with a slight male preponderance, account for 4-17% 0f all paediatric soft tissue tumour.[14] In our ward it represents 7.69% of the cases and most (7) of the cases occurred in the 1st decade of life, the rest in the 2nd decade.

Colorectal carcinoma (9) comes next in the list. The primary sites were Caecum and Ascending Colon (3) Colon and Rectum (2) Rectosigmoid (2) Splenic Flexure (1) and Rectum (1). There were 6 male patients and 3 female patients. The patients in 5~9 years age group were 2 in number and rest of the patients were in 10~14 years age group. All of the Adenocarcinoma of caecum patients were male (Age group of 10~14 years).[15]

Retroperitoneal Pelvic Lymphoma/Hodgkin's Lymphoma (HL) 8 cases (6.15%) is the next common frequent tumour presenting in our ward. Most of the lymphoma cases attend in our ward with the complaint of mass in the abdomen, others were referred from the paediatrics ward asking for tissue biopsy of the mass. In a study in NICRH, they found lymphomas to be the most common tumour (302, 24.2%) cases after retinoblastoma of which Retroperitoneal Pelvic Lymphoma/Hodgkin's lymphoma (74, 5.92%) forms a component.[16] This is in accordance with our study. Hepatic tumours (6) were Hepatoblastoma (5, 3.85%) and Hepatic Teratoma (1). In the study carried out in BSMMU, patient bulk was 17(24.2%) but another study shows it to be 50(1.59%) which matches nearly our studies.[7]

In our study Paediatric germ cell tumours included i) Non Seminomatous testicular tumours (Embryonal carcinoma of testis, Yolk sac tumour of testis) ii) Seminoma of testis iii) Ovarian tumours (Mature Ovarian tumour/Dermoid cyst, Ovarian Embryonal carcinoma, Ovarian carcinoma/Immature teratoma) iv) Metastatic spindle cell sarcoma/Germ cell tumour in abdomen v) Sacrococcygeal Teratoma vi) Presacral Dermoid cyst/Teratoma vii) Metastatic yolk sac tumour and viii) Retroperitoneal Teratoma. In a study under the cover of 'Paediatric Germ cell tumour' carried out in a tertiary hospital of NICRH, total 87 [Yolk sac tumour – 26 (Male – 19, female – 7) Dysgerminoma of Ovary – 28, Seminoma -3, Immature teratoma 17 (Male - 7, Female – 10) Embryonal carcinoma – 6 (Male 6, Female -0) Malignant mixed Germ cell tumour – 6, Teratocarcinoma – 1] patients were included, out of them female were 50(57.5%) and male 37(42.5%).[17] Though their number of cases were much more than our study, these results are more or less consistent with our study.

Ovarian tumours (5) presented in our ward were ovarian Dermoid/ mature Teratoma of ovary (3) ovarian carcinoma (1) and Embryonal carcinoma of ovary (1). 2 patients were in 5~9 years age group, and 3 patients were in 10~14 years age group. The overall percentage was 3.85%. In a study, the incidence of Germ cell tumour was 03% which is similar to our study[13]. Testicular tumours (3, 2.3%) presented as Seminoma of the testis (1), Embryonal carcinoma (1) and Yolk sac tumour (1). Seminoma was in the age group 10~14 years Embryonal carcinoma and Yolk sac tumour was in the 0~4 years age group.

MALToma/ Non-Hodgkin's Lymphoma of the gut/Intestinal Lymphoma (4) presented in our ward as a case of intestinal obstruction and represented 3.08%. Three patients were male and 1 patient was female, all of the patients were in 5~9 years age group. MALToma/NHL was less frequent than HL but, in a study, carried out in NICRH, NHL was more frequent than HL.[16] There were 3 cases of Retroperitoneal Teratoma (2.3%) admitted in our ward but in the literature, we found no cases of Retroperitoneal Teratoma. There were 2 cases of Neurofibroma, Presacral Dermoid cyst/Teratoma and Adenocarcinoma of caecum each. The Neurofibroma cases occurred only in females, one over face (10~14 years age group) and another (5~9 age group) over left side of neck, shoulder and chest. The Presacral or retro-rectal Dermoid cysts were extremely were tumours arising from primitive Embryonal germ cell layers. Both of these patients were male, one in the 0~4 years age group, another in 5~9 years age group. They presented with the complaints of constipation and other vague symptoms.

Rest of the cases were single occurring – Mesenteric Yolk sac tumour, Primary adrenocortical tumour with Cushing's syndrome with uncontrolled hypertension, Squamous cell carcinoma of tongue,

Metastatic spindle cell sarcoma in abdomen, Benign Mesenchymal tumour in Scapular region, Synovial sarcoma over left wrist joint, and Infantile pelvic sarcoma. In a study in NICRH, Bangladesh, there was a report of Lymphoma (24.2%) Retinoblastoma (17.4%) and Leukaemia (14.3%) being the most common childhood cancers while malignant bone tumours (7.3%) germ cell tumour, and epithelial tumour were more common tumours among adolescents.[16] In a study carried out in India, Brain tumours were the most common malignancies affecting 31.08% of children in their study and 27.8% of all brain tumours were astrocytoma. Second most common brain tumour was medulloblastoma affecting 21.6% of children.[12] In our ward, ophthalmological malignancies like Retinoblastoma were not admitted as they were referred to Department of Ophthalmology from OPD or emergency, Leukaemia is a haematological malignancy and the patients are admitted in the Department of Paediatric Haematology and oncology. Similarly, orthopaedic malignancies and brain tumour cases are admitted and treated in the Department of Orthopaedics and Neurosurgery respectively. So, there were no reports of Retinoblastoma, Leukaemia, bone and brain tumours in our study.

Limitations

This study has its own limitation of being a retrospective one. Data from single government hospital might not reflect all portion of the society as because patients with relatively lower socioeconomic conditions represent more in the government hospital and the scenario from private hospitals might be different. Moreover, all the patients admitted could not be included in the study due to unavailability of records.

Conclusion

Nephroblastoma and Neuroblastoma are the two commonest tumours in children. However, with increase in age, the types of tumour changes and more uncommon tumours happen in the children. There is a wide range of variation in the occurrence of tumour between sexes and among different age groups.

Recommendations

Prospective studies should be carried out to analyse the pattern and outcome of tumours in this institute which represent a large fraction of the population. Cancer registry also should be implemented for proper recording of data.

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Contribution of authors

MMS-Concept, data collection, manuscript writing & final approval.
TKC-Data analysis, critical revision & final approval.
MAAF-Interpritation of data, critical revision & final approval.
MAMR-Design, drafting & final approval.
MZC-Data collection, data analysis, drafting & final approval.

Disclosure

All the authors declared no competing interest.

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