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ORIGINAL ARTICLE Pediatric and Adolescent Cancers

Pediatric cancers in Bihar: A retrospective tertiary cancer center study

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Abstract

Background: There is lack of information regarding pattern of distribution of pediatric cancers in Bihar. Aim: The aim of this study is to identify the pattern of distribution of pediatric cancers. **Objectives:** To analyze demographic data, type, and pattern of pediatric cancers in Bihar by retrospective clinical audit. **Materials and Methods:** All individual consecutive patients between ages 0 and 18 years registered in the Department of Medical and Pediatric Oncology from January 1, 2018 till December 31, 2018, were enrolled in this study. Data pertaining to age, sex, and type of cancer were retrieved from clinical database by retrospective audit and stratified into hematolymphoid and solid pediatric cancer cohorts. Frequency distribution and descriptive statistics were used to analyze the data using SPSS version 17.0. **Results:** A total of 247 pediatric cancers were registered, of which 142/247 (57%) and 15/247 (43%) were pediatric hematolymphoid and solid cancers, respectively. The median age was 9 years, while male-to-female ratio was 2.26. Acute lymphoblastic leukemia (ALL), 76/247 (31%) was the most common pediatric cancer overall. Hodgkin's lymphoma, 27/142 (19%) was the second most common hematolymphoid malignancy, after ALL was 76/142 (54%). Among solid tumors, Wilms' tumor was the most common, 28/105 (27%) followed by Ewing's sarcoma, 16/105 (15%), and germ cell tumor, 15/105 (14%). Central nervous system malignancies were among the least common solid tumor cancers, 3/105 (3%). **Conclusion:** ALL and Hodgkin's lymphoma are the most common pediatric cancers. Among solid malignancies, Wilms tumor, Ewing's sarcoma, and Germ cell tumor are predominant.

Key words: Acute lymphoblastic leukemia, Bihar, childhood, pediatric cancer

Introduction

Pediatric malignancies occupy 5% of total cancer burden in India with 45,000 new cases registered yearly.[1] The standardized incidence rate for India ranged from 38 to 124 per million children per year compared to 75–150 per million worldwide.[2] Although cure rates of childhood malignancies exceed beyond 80% in Western countries, however, this golden milestone remains elusive in lower and middle income countries where 80% of children live worldwide.[2] Even in India, there is gross disparity between outcomes of childhood cancers reported by apex pediatric comprehensive cancer center like Tata Memorial Hospital, Mumbai, and centers in other urban population-based cancer registries (PBCRs) where outcomes drop by half.[3-5] In the absence of PBCR and lack of dedicated pediatric oncology centers, the profile of childhood cancers in most populous east Indian states of Uttar Pradesh and Bihar is lacking. We attempt to provide first comprehensive consecutive individual pediatric cancer data registered in 1 year in our tertiary government hospital/regional cancer center of Bihar.

Materials and Methods

Our center is the only regional cancer center of State Government catering the need of 120 million populations residing in Bihar. The Department of Medical and Pediatric Oncology of our Institute is the major primary referral unit for several childhood cancers diagnosed in any hospital/clinic across the state, including cases referred by allied specialties in the adjacent tertiary care hospital. All individual consecutive children diagnosed with any malignancy between ages 0 and 18 years and registered in our department from January 1, 2018 to January 31, 2018 were enrolled in this study. Demographic data with respect to age, sex, symptoms, and diagnosis were collected. Children were grouped into either with hematological malignancies or with solid tumor cancers.

Acute lymphoblastic leukemia (ALL), Hodgkin's lymphoma, acute myeloid leukemia, chronic myeloid leukemia, Burkitt's lymphoma, and non-Hodgkin's lymphoma comprised hematolymphoid group. All diffuse large B-cell lymphoma and lymphoblastic lymphoma were clubbed in non-Hodgkin's lymphoma group, while Burkitt's lymphoma was classified separately.

Among solid tumors, Wilms' tumor, Ewing's sarcoma, germ cell tumor, rhabdomyosarcoma (RMS), retinoblastoma, neuroblastoma, hepatoblastoma, soft-tissue sarcoma, osteogenic sarcoma, eosinophilic granuloma/Langerhans cell histiocytosis, cancer nasopharynx, and central nervous system tumors were included in the study. Soft-tissue sarcoma group excluded all bone tumors and rhabdomyosarcomas. Central nervous system tumors included medulloblastoma, ependymoma, and gliomas.

Tables, frequency distribution, and descriptive statistics, including cross-tabulation were used to analyze the data using SPSS software version 17.0 (IBM Corp., Armonk, NY, USA).

Results

Totally 247 pediatric cancers were registered in 1 year of which 142/247 (57%) and 15/247 (43%) were pediatric hematolymphoid and solid cancers, respectively. Overall, the median age was 9 years, while male-to-female ratio was 2.26. ALL, 76/247 (31%) was the most common pediatric cancer overall. Hodgkin's lymphoma, 27/142 (19%) was the second most common hematolymphoid malignancy, after ALL 76/142 (54%). Among solid tumors, Wilms' tumor was the most common, 28/105 (27%) followed by Ewing's sarcoma, 16/105 (15%), and germ cell tumor, 15/105 (14%) [Tables 1 and 2].

Among non-Hodgkin's lymphoma (15), there were eight lymphoblastic lymphomas and seven diffuse large B-cell lymphomas. Pediatric (non Rhabdomyosarcoma) soft – tissue

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Table 1: Distribution of childhood hematolymphoid malignancies

Diagnosis	Total cases	Boys	Girls	Median age (years)
ALL	76	57	19	8
Hodgkin's lymphoma	27	22	5	8
Non-Hodgkin's lymphoma*	15	10	5	13
Acute myeloid leukemia	9	7	2	16
Chronic myeloid leukemia	9	7	2	15
Burkitt's lymphoma	6	4	2	5
Total	142	107	35	10.5

*Non-Hodgkin's lymphoma=Diffuse large B-cell lymphoma+lymphoblastic lymphoma. ALL=Acute lymphoblastic leukemia

Table 2: Distribution of childhood solid malignancies

Diagnosis	Total cases	Boys	Girls	Median age (years)
Wilm's tumor	28	18	10	2.5
Ewing sarcoma	16	8	6	11.5
Germ cell tumor	15	6	8	10.5
Rhabdomyosarcoma	10	5	5	3.5
Retinoblastoma	9	5	4	3
Neuroblastoma	7	6	1	4
Hepatoblastoma	6	3	3	1
Soft-tissue sarcoma*	5	4	1	9
Osteogenic sarcoma	4	2	2	13
CNS	3	2	1	10.5
Eosinophilic granuloma	1	0	1	9
Cancer nasopharynx	1	1	0	14
Total	105	60	42	10.5

*Soft-tissue sarcoma only, excluding bone sarcomas and rhabdomyosarcoma. CNS=Central nervous system

sarcoma group (5), comprised of malignant fibrous histiocytoma (2), dermatofibrosarcoma protuberans (1), malignant peripheral nerve sheath tumor (1), and synovial sarcoma (1). The central nervous system malignancies were among the least common solid tumor cancers, 3/105 (3%), with one each of medulloblastoma, ependymoma, and astrocytic gliomas, respectively.

Discussion

Annually, more than 0.2 million new cases of pediatric cancers are diagnosed worldwide, of which 80% are from developing countries.[6] ALL is the most common pediatric cancer comprising 25%–30% of all childhood malignancies.[7] In Western nations, including the United State of America and Europe, ALL is closely followed by brain tumors (20%), lymphomas (12%–15%, neuroblastoma (6.5%), and Wilms' tumor (6%).[7,8] Overall 5-year survival has reached 80% across all major pediatric cancers, with Hodgkin's lymphoma and retinoblastoma surpassing 95% in developed world.[9]

In contrast to above, the demography and outcome of childhood cancers in developing world, including India is different. While ALL retains its position as the most common childhood cancer, the incidence of brain tumor is half in India compared to West, making lymphomas as the second most common malignancy.[2,10] Among lymphomas too, Hodgkin's lymphoma exceeds over non-Hodgkin's lymphoma, with mixed cellularity more common than nodular sclerosis with peak as much younger age due to early Epstein-Barr virus exposure compared to West.[4,11,12] Diffuse large B-cell lymphomas and lymphoblastic lymphomas supersede Burkitts/burkitts-like lymphoma among non-Hodgkin's lymphoma contrary to West.[2,5,13] While neuroblastoma are reported less frequently, the incidence of retinoblastoma has been placed higher in comparison to developed world.[2,4,14,15]

India reports significant male preponderance which can be partially explained by skewed gender selection of cases at time of presentation rather than true gender disparity.[16] Despite data mined from PBCRs, childhood cancers in India is still under diagnosed and less ascertained to due to the lack of awareness in public and rural physicians, insufficient skills, workforce, laboratory, financial constrains coupled with lack of availability, and access to specialized pediatric cancer centers.[17]

Bihar and Uttar Pradesh are the two most populous Indian states. Bihar has least per capita income and expenditure on health, with 45% of population still below the poverty line and half of the people being illiterate.[18,19] Due to the absence of PBCR and insufficient specialized tertiary cancer centers, the exact incidence and demographic profile of cancer is unknown, especially for pediatric malignancies. We report first individual consecutive pediatric cancer data from the only Government Regional Cancer Center equipped to treat pediatric cancer in Bihar. Compared to data from other major PBCRs in India, our report too suggests ALL as the most common pediatric cancer followed by Hodgkin's lymphoma. However, in solid cancers, Wilms' tumor tops the list followed by Ewing's sarcoma and germ cell tumor. Retinoblastomas are the modest in numbers compared to other PBCRs where much higher incidence is reported.

We have very small number of central nervous system tumors, which could be partially explained by fewer well-equipped magnetic resonance imaging scanning centers with trained anesthetists to sedate children with suspected brain tumors, leading to underdiagnosis. This is further compounded by ignorance among rural primary physicians to early symptoms of brain tumor, including headache, projectile vomiting, nystagmus, gait changes, and seizures. Referral from centers lacking neurosurgical intervention in Bihar despite radiological suspicion of brain tumor may cause spill of such cases to neighboring states with better set up. Lack of expertise to refer patients after neurosurgical intervention for chemotherapy and radiotherapy in medulloblastoma, ependymomas, and gliomas apart for financial constraints may further limit their presentation in the Medical Oncology Outpatient department.

Conclusion

ALL and Hodgkin's lymphoma are the most common pediatric cancers in Bihar. Among solid malignancies, Wilms' tumor, Ewing's sarcoma, and germ cell tumor are predominant. Retinoblastomas are the modest in number compared to that reported by other population-based registries in India. The central nervous system tumors are rare, largely due to being under diagnosed with inappropriate and inadequate referral.

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Conflicts of interest

There are no conflicts of interest.

References

1. Arora B, Kanwar V. Childhood cancers in India: Burden, barriers, and breakthroughs. Indian J Cancer 2009;46:257-9.

2. Arora RS, Eden TO, Kapoor G. Epidemiology of childhood cancer in India. Indian J Cancer 2009;46:264-73.
3. Arora B, Kurkure P, Parikh P. Childhood cancers: Perspectives in India. J Indian Med Assoc 2005;103:479-82.
4. Swaminathan R, Rama R, Shanta V. Childhood cancers in Chennai, India, 1990-2001: Incidence and survival. Int J Cancer 2008;122:2607-11.
5. Nandakumar A, Anantha N, Appaji L, Swamy K, Mukherjee G, Venugopal T, *et al.* Descriptive epidemiology of childhood cancers in Bangalore, India. Cancer Causes Control 1996;7:405-10.
6. Barr R, Riberio R, Agarwal B, Masera G, Hesseling P, Magrath I. Pediatric oncology in countries with limited resources. In: Pizzo PA, Poplack DG, editors. Principles and Practice of Pediatric Oncology. 5th ed. Philadelphia: Lippincott Williams and Wilkins; 2006. p. 1605-17.
7. Miller RW, Young JL Jr., Novakovic B. Childhood cancer. Cancer 1995;75:395-405.
8. Young JL Jr., Ries LG, Silverberg E, Horm JW, Miller RW. Cancer incidence, survival, and mortality for children younger than age 15 years. Cancer 1986;58:598-602.
9. Kaatsch P. Epidemiology of childhood cancer. Cancer Treat Rev 2010;36:277-85.
10. Black WC. Increasing incidence of childhood primary malignant brain tumors – Enigma or no-brainer? J Natl Cancer Inst 1998;90:1249-51.
11. Satyanarayana L, Asthana S, Labani S P. Childhood cancer incidence in India: A review of population-based cancer registries. Indian Pediatr 2014;51:218-20.
12. Parkin DM, Stiller CA, Draper GJ, Bieber CA. The international incidence of childhood cancer. Int J Cancer 1988;42:511-20.
13. Howard SC, Metzger ML, Wilimas JA, Quintana Y, Pui CH, Robison LL, *et al.* Childhood cancer epidemiology in low-income countries. Cancer 2008;112:461-72.
14. Tyagi BB, Manoharan N, Raina V. Childhood cancer incidence in Delhi, 1996-2000. Indian J Med Paediatr Oncol 2006;27:13-8.
15. 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 2010;11:1283-8.
16. Pearce MS, Parker L. Childhood cancer registrations in the developing world: Still more boys than girls. Int J Cancer 2001;91:402-6.
17. Swaminathan R, Sankaranarayanan R. Under-diagnosis and under-ascertainment of cases may be the reasons for low childhood cancer incidence in rural India. Cancer Epidemiol 2010;34:107-8.
18. Rasul G, Sharma E. Understanding the poor economic performance of Bihar and Uttar Pradesh, India: A macro-perspective. Reg Stud Reg Sci 2014;1:221-39.
19. Nayar KR, Kumar A. Health analysis-Kerala and Bihar: A comparison. YOJANA 2005; vol 49. Available from: https://www.papers.ssrn.com/sol3/papers.cfm?abstract_id=1354541. [Last assessed on 2019 Feb 06].