Spectrum of pediatric malignancy- A cancer hospital-based study

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Abstract

Objective: Childhood malignancy being a significant cause of mortality among children. The aim of the study is to find out the epidemiology of tumours in children in our region below <14 years age who presented to tertiary care Cancer hospital, Bhopal, M.P. for period of four years (2015-2018). Methodology: All children with cancer, aged 1-14 years diagnosed by mean of histological and cytological examination during a period of 4 years were reviewed. Results: During the period of four years 275 patients were diagnosed as having paediatric malignancies. According to year wise distribution highest incidence of cases were found in 2016 (32.72%). The highest number of cases, 96(35%) were in 10-14 years of age group and mean age was 7.43 with SD 4.0. Male were affected more than females with ratio of 2.66:1. It was observed that haematological malignancies were more common 172(62.54%) than the non haematological malignancies 103(37.45%). Leukemia 150 (54.54%) is most common pediatric cancer amongst which Acute lymphoblastic leukemia is most common haematological malignancy. Overall, it was found that most common cancer group in the present study were leukemia (54%) followed by lymphoma (8.36%), Brain tumours (7.27%) and Sarcoma (7.27%). Conclusion: Although the exact incidence rate cannot be provided by this hospital-based study, the information is useful in showing distribution patterns of childhood malignancy in this region.

Keywords: Childhood, Paediatric Malignancy, tumours, Spectrum

Introduction

Cancer in children can occur anywhere in the body, including the blood and lymph node, brain, spinal cord, kidney and other organs and tissue, Cancer begins when healthy cell change and grow out of control. In most type of cancer, these cells form a mass called a tumour. A tumour can be cancerous or benign. A cancerous tumour is malignant, meaning it can grow and spread to other part of the body. Tumors that occurs in children are as diverse as those in adult and present a number of challenges for pathologist [1].

Compared with cancers that occur in adult, childhood cancers are rare comprising only1% of all the cancers [2]. More than 10% of all death in children below 15-years of age are caused by malignant diseases in the developed countries. In the developing world, cancers are yet to be recognized as a major pediatric illness, however they are fast emerging as a distinct entity to be dealt upon [3]. Cancer is leading cause of death for children and adolescents around the world and approximately 300,000 children aged 0-15 years old are diagnosed with cancer each year [4]. Childhood malignancy being a significant cause of death among children. The aim of the study is to find out the spectrum of childhood (<14 years) cancers in patients who presented to Jawaharlal Nehru Cancer hospital, Bhopal, M.P. for period of four years (2015-2018).

Material and Method

Setting: This study was done in tertiary care Cancer hospital, Bhopal, M.P.

Duration: In this study four years data was collected from January 2015 to December 2018.

Type study: A cancer hospital based retrospective study.

Inclusion criteria: All children with cancer, aged 1-14 years diagnosed by mean of histological and cytological examination during four years period in JNCH (Jawaharlal Nehru Cancer Hospital), Bhopal were included in the study.

Exclusion criteria: All suspected cases but not confirmed pathologically.
Scoring system: The present study have followed ICC (International childhood cancer classification) to classify the tumours.

In this retrospective study, four years of hospital records were used from January 2015 to December 2018. All children with cancer, aged 1-14 years diagnosed by mean of histological and cytological examination during that period in tertiary care hospital at Bhopal were included in the study. Patient from all over M.P. and Chhattisgarh and adjoining states attend this hospital for better cancer care and cure. Data was analyzed according to age, sex, and histopathological and cytological basis. All tumours were diagnosed on routine hematoxylin and eosin stained section; special stain and immunohistochemistry was applied wherever necessary.

Fine needle aspiration cytology was done in some cases only. For the diagnosis of leukemia, complete blood count with peripheral smear examination, bone marrow aspiration and biopsy, flow cytometry was done to confirm the diagnosis. For children, the ICC (International childhood cancer classification) was used based on morphology of the tumours and is composed of 12 main groups.

Result

During the period of four years 275 patients were diagnosed as having paediatric malignancies. According to year wise distribution highest incidence of cases were found in 2016(32.72%) followed by 2017 (29.45%), 2015 (25.45%), 2018(12.36%) (Table 1)

Table-1: Years wise distribution of childhood cancer.

| Years   | Number | %   |
|---------|--------|-----|
| 2015    | 70     | 25.45 |
| 2016    | 90     | 32.72 |
| 2017    | 81     | 29.45 |
| 2018    | 34     | 12.36 |

Tumours were arranged according to their age wise incidence in 1-4 years 84(30.5%), 5-9 years95(34.54%), 10-14 years 96 (35%). The highest incidence was seen in 10-14years of age group and lowest in 1-4 years of age group

Table-2: Age wise distribution of childhood cancer.

| Age group            | Number | %        |
|----------------------|--------|----------|
| 1-year to 4 year     | 84     | 30.50%   |
| 5-year to 9 year     | 95     | 34.54%   |
| 10-year to 14 year   | 96     | 35%      |

Mean age 7.43 with SD 4.09

It was found that 200 (72.72%) Males were affected and 75(27.27%) Female. In the present study, it was found that the male were affected more than females a ratio of 2.66:1 (Table 3)

Table-3: Sex wise distribution of cases.

| Sex      | Number    |
|----------|-----------|
| Male     | 200(72.72%)|
| Female   | 75(27.27%) |

Male / female ratio 2.66

It was observed that haematological malignancies were more common 172 (62.54%) than the non-haematological malignancies 103 (37.45%). Leukemia 150 (54.54%) is most common pediatric cancer amongst which Acute lymphoblastic leukemia is most common haematological malignancy. It accounts for 122 (44.36%) of total malignancies and 71% of total haematological malignancies. Amongst haematological malignancies ALL is followed by AML 23(8.36%), Non-Hodgkins Lymphoma 17 (6.18%) and Hodgkin’s Lymphoma 6 (2.18%) CML 5 (1.81%). Most common Non haematological malignancy is Sarcoma 20 (7.27%) and Brain tumours 20 (7.27%) followed by Osteosarcoma 8 (2.90%) Neuroblastoma 8 (2.90%), Retinoblastoma 8 (2.90%) Wilm’s tumours 6 (2.18%)
Table-4: Distribution of childhood cancer according to type and age (years).

| TYPE          | Total  | 1-4  | 5-9  | 10-14 |
|---------------|--------|------|------|-------|
| ALL           | 122 (44.36%) | 44 (16%) | 45 (16.35%) | 33 (12%) |
| AML           | 23 (8.36)     | 8 (2.90)   | 7 (2.54)  | 8 (2.90) |
| NHL           | 17 (6.18)     | 0          | 10 (3.63) | 7 (2.54) |
| HL            | 6 (2.18)      | 0          | 3 (1.09)  | 3 (1.09) |
| CML           | 5 (1.81)      | 0          | 2 (0.73)  | 3 (1.09) |
| Sarcoma       | 20 (7.27)     | 2 (0.73)   | 10 (3.63) | 8 (2.90) |
| Brain tumour  | 20 (7.27)     | 4 (1.45)   | 6 (2.18)  | 10 (3.63) |
| Osteosarcoma  | 8 (2.90)      | 1 (0.36)   | 0         | 7 (2.54) |
| Retinoblastoma| 8 (2.90)      | 3 (1.09)   | 5 (1.81)  | 0       |
| Neuroblastoma | 8 (2.90)      | 5 (1.81)   | 3 (1.09)  | 0       |
| Ewing’s sacoma| 7 (2.90)      | 0          | 2 (0.73)  | 5 (1.81) |
| Wilms tumour  | 6 (2.18)      | 5 (1.81)   | 1 (0.36)  | 0       |
| Cancer liver  | 3 (1.09)      | 3 (1.09)   | 0         | 0       |
| Cancer Nasophyrenx | 3 (1.09) | 0 | 0 | 3 (1.09) |
| Cancer ovary  | 3 (1.09)      | 0          | 0         | 3 (1.09) |
| Cancer lung   | 2 (0.73)      | 1 (0.36)   | 0         | 1 (0.36) |
| Cancer Stomach| 2 (0.73)      | 1 (0.36)   | 1 (0.36)  | 0       |
| Cancer Testis | 2 (0.73)      | 2 (0.73)   | 0         | 0       |
| Hepatoblastoma| 2 (0.73)      | 2 (0.73)   | 0         | 0       |
| Germ cell tumour| 2 (0.73) | 0 | 0 | 2 (0.73) |
| Rhabdomayosarcoma | 1 (0.36) | 1 (0.36) | 0 | 0 |
| Spindle cell cancer | 1 (0.36) | 0 | 0 | 1 (0.36) |
| Renal cell carcinoma | 1 (0.36) | 1 (0.36) | 0 | 0 |
| APML          | 1 (0.36)      | 0          | 0         | 1 (0.36) |
| PNET          | 1 (0.36)      | 1 (0.36)   | 0         | 0       |
| Spine secondary| 1 (0.36)     | 0          | 0         | 1 (0.36) |

Discussion

In JNCH during the period of four years 275 patients were diagnosed as having paediatric malignancies. In present study, it was observed that most common pediatric cancer cases diagnosed was leukemia (54.54%) amongst which ALL (44.36%) is most common of all malignancy. These results are similar to other studies. [5,6,7,8,9]. It was found that most common cancer group in the present study were leukemia (54%) followed by lymphoma (8.36%), Brain tumours (7.27%) and Sarcoma (7.27%). This result is contrary to study done by Jabeen et al showed that Lymphoma (24.2%) followed by Retinoblastoma (17.4%), leukemia (14.3%) [10]. Study by Munlima et al showed that most common cancer group was leukemia (26.9%) followed by Retinoblastoma (15.9%), CNS tumour (14.5%), Lymphoma (13.1%) [11].

In present study, it was observed that proportion of males 2.66% which were higher than studies by others [7,12,10,13]. Mean age in the present study was 7.43 with SD 4.09 which is slightly higher than study by Haleh et al [9].

In this study most of cases were in age group of 10-14 years (35%), Similar finding was seen in a study by Rajpal et al showed similar results in the age group of 10-14 years (58.18%) [14]. This result is contrary to study done by others in which most cases were between to 5-9 years age group [7,11,15]. Some Studies found most common age is 0-4 years [13,16]. In the present study, all cases were 36% in 0-4 years age group and found similar numbers in 5-9 years of age group]
The etiology of childhood cancers is largely unknown. Although genetic factors, environmental factors, maternal use of oral contraceptive pills, living in near to high voltage power line, ionizing radiation exposure during pregnancy, pesticide exposure in parents, parental occupation smoking are the factors [15].

Few environmental risk factors such as exposure to air pollutants and radiation play an important role in the incidences of childhood cancers [17]. Incidence of these cancers varies throughout the world with regard to age, gender, ethnicity, socioeconomic status and geography [7].

Apart from being retrospective study this study has the limitation this current study is a single institution based study restricted by a small sample size and hence this retrospective review cannot serve as a benchmark for reference, Hence further multi institutional studies over a longer duration of time needs to be done to serve as a benchmark for future.

Conclusion

Although the exact incidence rate cannot be provided by this single institution-based study, the information is useful in showing distribution pattern of childhood malignancy in this region. It is not possible to prevent cancer in children. The most effective way to reduce the incidence of cancer is to focus on early and correct diagnosis followed by effective therapy.

Programmes to promote early and correct diagnosis have been successfully used in countries of all income level, often through collaborative effort of government, civil society and non-government organization with vital roles played by parent group.

What this study adds to existing knowledge?

This study is a single institution-based study done in Jawahar Lal Nehru cancer hospital, Bhopal. This is oldest cancer hospital in this region and patients comes from all over the Madhya Pradesh, Chhattisgarh and adjoining areas, hence from the study, a representation of spectrum of various malignancies in this part of India was generated.

Author’s contribution

Dr. Vidhi Gupta: Data collection, data analysis, literature search, drafted initial manuscript and approved the final manuscript before submission.

Dr. Ashish Kalraiya: Conceptualized the study, develop the study design, did literature search, data analysis, revised the manuscript and approved the final manuscript before submission.

Dr. Dinesh Mekle: Data analysis, literature search, revised the manuscript and approved the final manuscript before submission

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Ethical Approval: This study was approved by the Institutional Ethics Committee.

Abbreviations

| TYPE      | Abbreviation                          |
|-----------|---------------------------------------|
| ALL       | Acute lymphoblastic leukemia          |
| AML       | Acute myeloid leukemia                |
| CML       | Chronic myeloid leukemia              |
| NHL       | Non- Hodgkin Lymphoma                 |
| HL        | Hodgkin Lymphoma                      |
| -APML     | Acute Promyelocytic leukemia          |
| PNET      | Primitive Neuro Ectodermal tumour     |
References

1. Sharma S, Mishra K, Agrawal S, Khanna G. Solid tumors of childhood. Indian J Pediatr.2004;71:501-504. doi: https://doi.org/10.1007/BF02724289.

2. Lanier AP, Holck P, Ehgamma D, Key C. Childhood cancer among Alaska Natives. Pediatr.2003;112(5):e396. doi: https://doi.org/10.1542/peds.112.5.e396.

3. Kusumakumary P, Jacob R, Jothirmayi R, Nair MK. Profile of pediatric malignancies. A ten years study. Indian Pediatr.2000;37:1234-1238.

4. Steliarova-Foucher E, Colombet M, Ries LAG, Moreno F, Dolya A, Bray F, et al. International incidence of childhood cancer, 2001-10: A population-based registry study. Lancet Oncol. 2017;18(6):719-731. doi: https://doi.org/10.1016/S1470-2045(17)30186-9.

5. Fethi A, Amani F, Bahadoram M. Epidemiology of childhood cancer in Northwest Iran. Asian Pac J Cancer Prev.2015;16 (13): 5459-5462. doi: http://dx.doi.org/10.7314/APJCP.2015.16.13.5459.

6. Jafroodi M, Ghandi Y. Epidemiologic evaluation of pediatric malignancies in 17 shahvar hospital. J Guilan Univ Med Sci.2009;17(68):14-21.

7. Ghasemi M, Karami H, Abedian-Kenari S, Kianifar S. Patterns of cancer in the children admitted in Avicenna Hospital in Sari, Iran. Int J Haematol: Oncol Stem Cell Res. 2011;5(2):29-33.

8. Das S, Paul DK, Anshu K, Bhakta S. Childhood cancer incidence in India between 2012 and 2014: Report of a population – Based cancer Registry. Indian Pediatr.2017;54 (12): 1033-1036. doi: https://doi.org/10.1007/s13312-017-1207-y.

9. Arora RS, Eden T, Kapoor G. Epidemiology of childhood cancer in India. Indian J Cancer.2009;46 (4): 264-273. doi: https://doi.org/10.4103/0019-509X.55546.

10. Jabeen S, Haque M, Islam M.J, Talukdar M. H. Profile of pediatric malignancies. A five years study. J Dhaka Med Coll.2010;19(1):33-38. doi: https://doi.org/ 10.3329/jdmc.v19i1.6249.

11. Hazarika M, Krishnatreya M, Bhayan C, Saikia BJ, Katakai AC, Nandy P, et al. Overview of childhood cancers at a Regional cancer centre in North-East India. APJCP. 2014; 15(18):7817-7819. doi: https://doi.org/10.7314/ APJCP. 2014.15.18.7817.

12. Boroumand H, Moshki M, Khajavi A, Darabian M, Hashemizadeh H. Epidemiology of childhood cancer in Northeast of Iran,Iran J Ped Hematol Oncol.2016;17(1): 9-15. Available at http://ijpho.ssu.ac.ir/article-1-281-en.html

13. Bhalodia JN, Patel MM. Profile of pediatric Malignancy: A three years study. Nat J Comm Med.2011; 2(1):24-27.

14. Punia RS, Mundi I, Kundu R, Jindal G, Dalal U, Mohan H. Spectrum of nonhematological pediatric tumors. A clinicopathologic study of 385 cases. Indian J Med Paediatr Oncol.2014;35(2):170-174. doi: https://dx.doi.org/ 10.4103%2F0971-5851.138995.

15. Hashemizadeh H, Boroumand H, Noori R, Darabian M. Socioeconomic status and other characteristics in childhood leukemia. Iran J Pediatr Hematol Oncol. 2013; 3(1): 182-186.

16. Holmes L, Vanderberg j, McClarin L, Dabney K. Epidemiologic, racial and healthographic mapping of Delaware pediatric cancer. Int J Environ Res Public Health. 2015;13(1):49. doi: https://doi.org/10.3390/ijerph13010049.

17. Amini H, Seifi M, Niazi-Esfyani S, Yunesian M. Spatial epidemiology and pattern analysis of childhood cancers in Tehran Iran. J Advan Environ Health Res.2014; 2(1):30-37. doi: https://dx.doi.org/10.22102/jaehr. 2014.40141.

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