# Histopathological Profile of Non-Haematological Paediatric Neoplasms in Hadoti Region of Rajasthan

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**ABSTRACT**

**BACKGROUND**

Malignancy is a major cause of childhood death in developed countries. In developing countries like India, paediatric tumours are rising day by day. Proper management of paediatric tumours needs epidemiological data in various geographical areas. The present study was carried out to classify and find out the histopathological profile of solid tumours of childhood and infancy in 0 - 14 years age group from 1st January 2015 to 31st December 2017.

**METHODS**

We studied histopathology reports of 173 paediatric tumours over a period of 3 years. All the biopsy cases of solid neoplasms in the age group 0 - 14 years were included.

**RESULTS**

In our study of 173 paediatric tumours, 133 (76.87 %) were benign and 40 (23.12 %) were malignant. Maximum incidence of malignant paediatric tumours was seen in the age group of 0 - 14 years [12.13 % (21 out of 173)], with male to female ratio of (1:1.3). Amongst the benign tumours, vascular tumours were most common [27.74 % (48 of 173 cases)], with highest incidence of haemangioma [68.75 % (33 of 48 cases)]. Amongst the malignant tumours, most common were bone tumours [6.35 % (11 of 173 cases)] and amongst bone tumours, Ewing's sarcoma accounted for 63.63 % cases (7 of 11 cases).

**CONCLUSIONS**

The incidence of paediatric neoplasms in Hadoti region of Rajasthan is 0.75 % and the majority (54.33 %) of neoplasms occurred in 10 - 14 yrs. age group.

**KEYWORDS**

Histopathology, Paediatric, Non-Haematological Neoplasms

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## BACKGROUND

The spectrum of paediatric tumours of infancy and childhood varies considerably, from those derived from blastemal cells of different organ and organ systems, proliferations of soft tissue supporting cells, and hamartomatous processes that looks like malignant tumours.[1] Both benign and malignant tumours require a coordinated method for diagnosis.

In our study, we have used the latest WHO classification (2008). According to literature, the frequency of presentation is highest in the first year of age, for well-differentiated tumours and poorly differentiated tumours are commoner in the third year of age. Bilateral and unilateral well-differentiated tumours, present earlier than poorly differentiated tumours.[2] Tumours in children are as diverse as those of adults and present as a huge challenge for the pathologist.

The Government Medical College (GMC), Kota is the biggest draining hospital in Hadoti region where the major patient population comes from the urban middle class and neighbouring villages. GMC Kota treats cases referred from the various satellite hospitals etc. The types of paediatric tumours encountered in Kota region, are not well documented until now. That adds to the fact that, no significant data is available on the frequency of various types of paediatric neoplasms in our region. The purpose of this study is to estimate the frequency and histological patterns of paediatric tumours as encountered in the Pathology Department of Government Medical College & Attached Hospitals, Kota. To study the incidence and distribution pattern of various non-haematological paediatric neoplasms in Kota region during a period of 3 years (from 1st January 2015 to 31st December 2017). To review the slides of all the cases of non-haematological paediatric neoplasms diagnosed histopathologically during the above mentioned period. These cases include retrospective as well as prospective cases. To classify all the diagnosed cases according to WHO Classification (2008). Compare the results of present study with various other studies.

The spectrum of paediatric tumours of infancy and childhood varies considerably and differs from that in adults. Almost any tumour may be found in children, however in general, the principle groups of cancer are leukaemias, lymphomas, and sarcomas, whereas in adults the chief cancers are carcinomas.[3] The manner of grouping the cancers is also different. For children, the International Classification of Childhood Cancer (ICCC) is used based on morphology of the tumours and is composed of 12 main groups.[4] Benign tumours are commoner than the malignant tumours. Mostly benign tumours are of little concern but sometimes they may cause serious disease by virtue of their location or rapidly increasing size.[5] Both benign and malignant tumours need a comprehensive evaluation for diagnosis to provide an accurate diagnosis for designing proper therapy and predicting the outcome.

The spectrum of malignancies of childhood has a great regional variation owing to the environment and differences in genetic make-up.[6]

The incidence and frequency of childhood tumours in India has a great geographical variability. In India, since infections and poverty leading to malnutrition are the major factors contributing to morbidity and mortality, malignancies are coming into greater focus because of preventive measures being taken by the Government for these reasons.[7]

As per International Incidence of Childhood Cancer Volume 1, IICC-1 in 1988[8] and IICC-2 in 1998,[9] there are no internationally comparable data on incidence patterns of childhood cancer have been published. To address this problem, International Agency for Research on Cancer (IARC), in collaboration with the International Association of Cancer Registries (IACR), has done a study to evaluate the incidence of childhood cancer all over the world, the complete results of which will be published in IICC-3. The target age range for IICC-3 is 0 - 19 years, compared with 0 - 14 years in IICC-1 and IICC-2. Since there is a shortage of data in age group of 15 - 19 years inclusion of the 15 - 19 years age group was done. This age range of 0 - 19 years was also chosen in other US and European studies of childhood cancer incidence and their survival.[4,10]

## METHODS

This study was conducted among all the cases of non-haematological paediatric neoplasms. Biopsy specimens of which were received and diagnosed in Department of Pathology, GMC, Kota between 1st January 2015 to 31st December 2017. Relevant clinical data was taken from the case records of medical record department of GMC, Kota. The records were taken for retrospective patients, which included:-

a. Age and sex of the patients.
b. Symptoms with duration.
c. Clinical findings.
d. Gross features and microscopic features as per records.

All the biopsy specimens of paediatric neoplasms sent for histopathological evaluation were preserved in 10 % formalin. The biopsy tissues were processed, embedded in paraffin wax and 3 – 4 micron thin sections were made. These were stained with Haematoxylin and Eosin (H&E). Finally, the findings of the present study, were recorded and compared with the findings of various other studies.

### Exclusion Criteria

All haematological malignancies were excluded e.g. leukaemias.

## RESULTS

The present study was conducted on 173 specimens, received in Department of Pathology, Government Medical College, Kota, during a period of 3 years (from 1st January 2015 to 31st December 2017).

Paediatric age group from 0 - 14 years was taken in the present study. Out of 173, 75 were retrospective and 98 were prospective.

Previous records were studied in the retrospective group and also correlated with their radiological findings. The cases in prospective groups were correlated with age, clinical data and CT / MRI findings. Out of 173 cases 133 were benign and 40 cases were malignant, which were analyzed and classified based on the morphology. WHO classification (2008) has been followed to diagnose and tabulate these lesions.

## DISCUSSION

The present study was conducted in 173 cases of paediatric neoplasms, encountered in GMC, Kota, that draws a substantial population of Kota region. The objective of recording the occurrence and the morphological spectrum of paediatric neoplasms is to correlate with the age and sex of the patients and to assess the usefulness of IHC (Immuno histochemistry) in establishing the histopathological diagnosis. All these aspects have been studied by many other authors. Comparison of results in the present study with results recorded in the literature have been done. It is to be pointed out, that our sample size was quite small, and the epidemiological data differed in a few neoplasms in comparison with the literature that was reviewed.

The age distribution of paediatric neoplasms peaks in 10 - 14 years 41.67 % (Tanvi Monga et al 2017).[11] Our study had 57.22 % cases compatible to the study conducted by Punia et al. 2014,[12] that showed peak incidence 58.18 %.

There is, in general sex ratio (M : F) has been found to be 1.5 - 1.6 (Jabeen S et al 2010, Punia et al. 2014).[13,12] In our study, out of the 173 cases, we recorded that 43.35 % were male, rest were 56.06 % females (ratio 1:1.3). The study done in Punjab was quite compatible with our study, Tanvimonga et al 2017[11] from Punjab had a total of 168 paediatric tumours of which 50 % were males and 50 % were females.

The paediatric tumours were divided into two types benign and malignant tumours. Benign tumours accounting for 2.96 %, rest malignant tumours 2 % (Tanvi et al. 2017).[11] However in the study by Punia et al. 2014[12] benign tumours were 71.42 % and malignant tumours were 28.57 %, that is comparable to our study. Of the 173 cases, 133 were benign, constituting 76.87 % of the cases, and malignant being 23.12 %. Tumours that occurs in children are as diverse as those in adults and present a number of challenges for the pathologist. (Sharma S et al. 2004)[14] Compared with cancers that occur in adults, childhood cancers are comprising 1 % of all the cancers. (Lanier AP et al. 2003)[15] > 10 % of all deaths in children below the teen age are caused by malignant diseases in the developed countries. In the developing countries, childhood cancers are yet to be recognized as a major paediatric illness; however, they are rapidly emerging as a distinct entity to be dealt upon. (Kusuma Kumary P el al. 2000)[16]

### Benign Tumours

The majority of soft tissue tumours in young adults are benign vascular or fibroblastic proliferations. (Malone M et al. 1993)[17] Majority of breast masses in the paediatric age group are benign, but malignant do occur. (Kaneda HJ et al. 2013)[18] Fibroadenoma is the most frequent breast tumour in adolescent girls. (Bock K et al. 2005)[19] Pilomatricoma which is one of the most common cutaneous appendage tumours in patients 20 year of age or younger, is of hair matrix origin. (Demircan M et al. 1997)[20]

Table 1 shows according to Ali EA & Talib SHS 2009[21] study, the majority of tumours were soft tissue tumours (39.1), followed by bone tumours (25 %), breast tumours (4.3 %) and skin and adnexal tumours (2.1 %). The 8 years study conducted by Punia et al, 2014,[12] soft tissue tumours (50.91 %), followed by bone tumours (22.55 %), breast tumours (8.73 %), skin and adnexal tumours (8.36 %) In the study by Tanvi et al 2017,[11] soft tissue tumours (56.48 %), followed by breast tumours (14.82 %), skin and adnexal tumours (11.11 %), bone tumours (8.33 %). Our study showed soft tissue tumours (60.90), followed by bone tumours (12.03 %), breast tumours (9.02 %), skin and adnexal tumours (3.75 %)

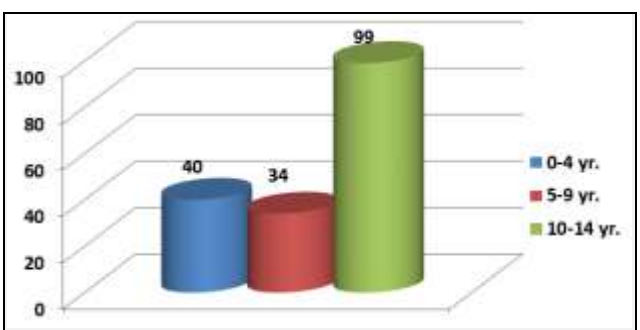


***Figure 1. Age Distribution of Paediatric Neoplasms (173 Cases)***

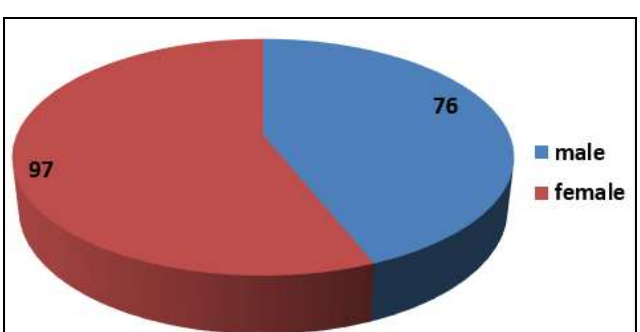


***Figure 2. Sex Distribution (n = 173)***

### Malignant Tumours

The most frequent sites of childhood cancer are the haematopoietic system, nervous tissue, soft tissue, bone and kidney. This is in contrast to adults in whom the skin, lung, breast, prostate and colon are the most common sites of tumours. (Maitra A et al. 2010)[5] Diagnosis of bone tumours requires correlation of clinical, radiographic and pathologic findings. The major bone tumours diagnosed were ES / PNET (Ewing's Sarcoma/Primitive Neuro Ectodermal Tumour) and osteosarcoma, most common in 10

- 14 years age group which coincides with other series. (Banerjee CK et al. 1986),[7] The analysis based on data collected by the Manchester Children's Tumour Registry during a 45-year time period (1954 - 1998) revealed 2511 non lymphoreticular solid tumours, of which 1055 were CNS tumours, astrocytoma being the most common. (McNally RJ et al. 2001)[22] Rhabdomyosarcoma comprises the most common single soft tissue sarcoma among children and adolescents and frequently occurs in the head and neck region. (Parham DM et al 2006)[23]

Hodgkin Lymphoma has a bimodal peak age distribution: In developed countries the first peak occurs in the middle to late 20's and the second peak occurs in adults after the age of 50 year, whereas in the developing countries the early peak occurs before adolescence. (Toma P et al. 2007)[24] Retinoblastoma, a primary intraocular malignancy is the most common intraocular malignancy of childhood. (Madhavan J et al. 2007)[2] Germ cell tumours were mostly gonadal as is frequently seen. (Ueno T et al 2004)[25]

Table 2 shows According to Ali EA & Talib SHS 2009[21] study, the majority of tumours were Lymphoma (24.09 %), followed by CNS tumours (16.8 %), bone tumours (13.2 %) and renal tumours (10.8 %), germ cell tumours (4.8 %), soft tissue sarcoma (3.6 %), malignant epithelial neoplasms (2.4 %). The 8 years study conducted by Punia et al, 2014,[12] bone tumours (32.73 %), CNS tumours (23.64 %), soft tissue sarcoma (17.27 %), lymphoma (7.27 %), malignant epithelial neoplasm (7.27 %), germ cell tumours (3.64 %).

The 15 years study conducted by Tanvi et al 2017,[11] lymphoma (36.67 %), germ cell tumours (16.67 %), malignant bone tumours (15 %), soft tissue sarcoma (11.67 %), CNS tumours (6.67 %), renal tumour (3.33 %), malignant epithelial tumours (1.66 %). It was hard to compare the different studies due to the difference in the case material and prevalence of the lesions, but our study showed malignant bone tumour comprising of 27.5 % of the malignant paediatric tumours. CNS tumours were second prevalent with 22.5 %, that followed soft tissue sarcoma (17.5 %), lymphoma (10 %), germ cell tumour (7.5 %), malignant epithelial tumours (7.5 %). Rest include renal tumour (5 %).

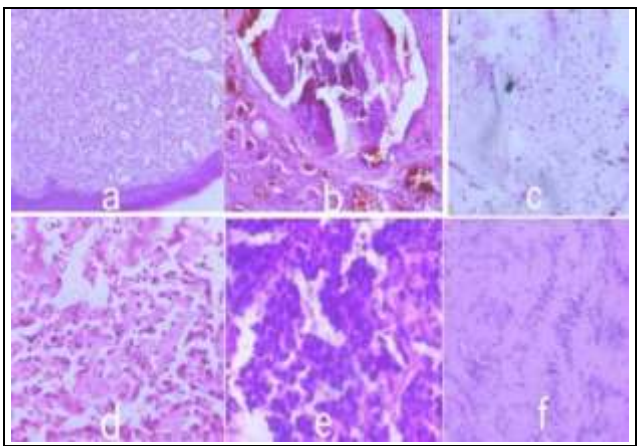


***Figure 3. Microphotograph: (a) Haemangioma (H & E 10X) Showing Increasing Number of Thin Wall Capillaries; (b) Hamartoma (H & E 10X) Showing Thrombosed Vessels; (c) Enchondroma (H & E 10X) Showing Abundant Cartilaginous Matrix, Low Cellularity; (d) Osteosarcoma (H & E 20X) Showing Atypical Osteoblast & Osteoid Matrix; (e) Ewing Sarcoma (H & E 40X) Showing Rosettes; (f) Schwannoma (H & E 20X) Showing Biphasic Tumour with Highly Ordered Cellular Component (Antoni A) that Shows Palisading (Verocay Bodies)***

| Tumours | Tanvi et al 2017 (%) n = 108 | Punia et al 2014 (%) n = 191 | Ali EA & Talib SHS 2009 (%) n = 92 | Lee et al 1966 (%) n = 171 | Current Study (%) n = 133 |
|---|---|---|---|---|---|
| Soft Tissue Tumours | 56.48 | 50.91 | 39.1 | 48.53 | 60.90 |
| Bone Tumours | 8.33 | 22.55 | 25 | 7.60 | 12.03 |
| Breast Tumours | 14.82 | 8.73 | 4.3 | 5.26 | 9.02 |
| Skin and Adnexal tumours | 11.11 | 8.36 | 2.1 | 26.31 | 3.75 |
| Miscellaneous | 9.26 | 9.45 | 29.5 | 12.30 | 12.78 |

***Table 1. Comparison of Benign Tumours (%)***

| Tumours | Banerjee et al 1986 (%) | Sharma S et al 2004 (%) | Ali EA & Talib SHS 2009 (%) | Jabeen S et al 2010 (%) | Bhalodia J N et al 2011(%) | Punia et al 2014 (%) | Tanvi et al 2017 (%) | Lateef et al 2018 (%) | Present Study (%) |
|---|---|---|---|---|---|---|---|---|---|
| Lymphoma | 25.92 | 21.41 | 24.09 | 24.2 | 16.27 | 7.27 | 36.67 | 23.91 | 10 |
| CNS Tumours | 15.32 | 9.74 | 16.8 | 3.7 | 6.97 | 23.64 | 6.67 | 8.6 | 22.5 |
| Renal Tumours | 8.4 | 19.48 | 10.8 | 6.8 | 9.3 | - | 3.33 | 4.3 | 5 |
| Malignant Bone Tumours | 10.52 | 9.74 | 13.2 | 7.3 | 2.32 | 32.73 | 15 | 8.6 | 27.5 |
| Soft Tissue Sarcoma | 14.3 | 7.79 | 3.6 | 19.3 | 2.32 | 17.27 | 11.67 | 13.04 | 17.5 |
| Germ Cell Tumours | 3.8 | 8.44 | 4.8 | | - | 3.64 | 16.67 | 6.6 | 7.5 |
| Malignant Epithelial Neoplasms | - | - | 2.4 | | - | 7.27 | 1.66 | - | 7.5 |

***Table 2. Comparison of Malignant Tumours (%)***

## CONCLUSIONS

Thus, from our study we concluded that the incidence of paediatric neoplasms in Hadoti region of Rajasthan is 0.75 % and the majority (54.33 %) of neoplasms occurred in 10 - 14 yrs. age group.

Many of the paediatric solid tumours are of embryonal or developmental cancers because they arise in young children as a result of defect in the processes of organogenesis or normal growth process. There are regional differences in these neoplasms also and hence there was a need for the study. Histopathology is the primary means of diagnosis and is the gold standard. The study included mainly female children accounting for 56.06 % of cases. Benign neoplasms (76.87 %) were more common and malignant neoplasms accounted for 23.12 %. Among the benign neoplasms, the vascular tumours (hemangioma - 68.75 %) are the most

common tumours i.e. 27.74 % and the second most common benign neoplasms were bone tumours i.e. 9.24 %. Amongst the malignant neoplasms, bone tumours (6.35 %) were the most common. Amongst the malignant bone tumours, Ewing sarcomas were the most common accounting for 63.63 %. Second most common malignant neoplasms were CNS tumours (5.20 %). This study is an attempt to provide a complete spectrum of childhood tumours diagnosed on histopathology in Hadoti region. Morphology of the tumour is still the gold standard for diagnosis.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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