MALIGNANCIES IN CHILDHOOD: A RETROSPECTIVE STUDY

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ABSTRACT

BACKGROUND

Barring malnutrition and infection, cancer is the most common cause of death in children below the age of 14 years of age. Malignancies are coming into greater focus because of the preventive measures being taken for the former.

In general, the features of malignancy in children differ greatly from neoplasm in adults. Tissues which are developing and growing are more likely to undergo neoplastic transformation. Hence, high incidence of embryonic cancers in children.

Today, the diagnosis of cancer particularly in children is still regarded as in some circles as death sentences for the malignant disease is second only to trauma and infectious diseases as a killer in children above the age of one year. Hence, early diagnosis and confirmation by haematological and histopathological methods are crucial in early diagnosis and treatment.

MATERIALS AND METHODS

This study was undertaken to evaluate the incidence and morphological features of malignant neoplasm occurring in children. The present study is a retrospective study undertaken in the Department of Pathology, JJM Medical College, Davangere, over a period of three years, i.e., March 1994-February 1997. The material was obtained from paediatric patients aged from 0-14 years admitted to Chigateri General Hospital, Bapuji Child Health Institute attached to JJM Medical College, Davangere, and Hospitals and nursing homes in and around Davangere.

RESULTS

1. This study presents an observation on the paediatric malignancies in relation to age, sex and incidence and in the clinical and morphological findings.
2. The malignant tumours in paediatric age group are less common and they form about 10.90% of malignant tumours occurring at all ages.
3. These tumours show a slight male preponderance compared to females in the ratio of 1.2:1.
4. 38.75% of the tumours were encountered in children below the age of 5 years. Most of the tumours (61.25%) occurred between 6-14 years indicating a higher incidence with increasing growth.
5. The commonest tumours in the order of frequency were leukaemia's (38.75%), lymphomas (16.25%), retinoblastoma (8.75%), Wilms tumour (6.25%) and Ewing's tumour (6.25%).

CONCLUSION

The malignancies in the childhood are a commonest cause of death in the west after the accidents whereas in India it is the next common causes of death after malnutrition and infections. As the embryonic tumours have good prognosis if diagnosed early and treated if it suggested that the antenatal data regarding the aetiological factors and screening of children of such parents for the possible childhood tumours will help us to control and treat the childhood tumours well in advance.

KEYWORDS

Malignant Tumours, Paediatric Tumour, Leukaemia in Children, Soft Tissue Tumour in Children, Pnet.

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BACKGROUND

Cancer is essentially a disease of adults and is regarded as disease of elderly both by laymen as well as some physicians. Yet, it is one of the common killers in childhood. Malignancy, in general is rarity in children, but is gradually becoming more common in many parts of the world. It is the second most common cause of death (After accidents) in children more than one year old.

At the turn of the century, the contagious or communicable diseases were the leading cause of morbidity and mortality in children. But, with the control of these diseases, malignancy has become one of the foremost challenges in paediatric practice.

Barring malnutrition and infection, cancer is the most common cause of death in children below the age of 14 years of age. Malignancies are coming into greater focus because of the preventive measures being taken for the former.

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Malignancy in Children Attracts More Attention Due to

1. Sick child affects the functioning of the entire family, which often is just emerging as a social and economic unit.
2. The disruption of normal life, prolonged and costly care impinge on the family at a crucial point in its development.
3. The after effects of treatments used to cure the child today can produce the chronically ill adult of tomorrow.

In general, the following of malignancy in children differ greatly from neoplasm in adults. Tissues which are developing and growing are more likely to undergo neoplastic transformation. Hence, high incidence of embryonic cancers in children.

Today, the diagnosis of cancer particularly in children is still regarded as in some circles as death sentence for the malignant disease is second only to trauma and infectious diseases as a killer in children above the age of one year. Hence, early diagnosis and confirmation by haematological and histopathological methods are crucial in early diagnosis and treatment.

Only a few studies are found in the literature regarding the cause. Pathogenesis, histological appearances, factors determine the prognosis, management and related aspects of malignant tumours of childhood.

The Present Study of Malignant Tumours in Children is undertaken to evaluate

1. Incidence of malignant tumours in children.
2. The histological types and morphological features of malignant tumours in children.

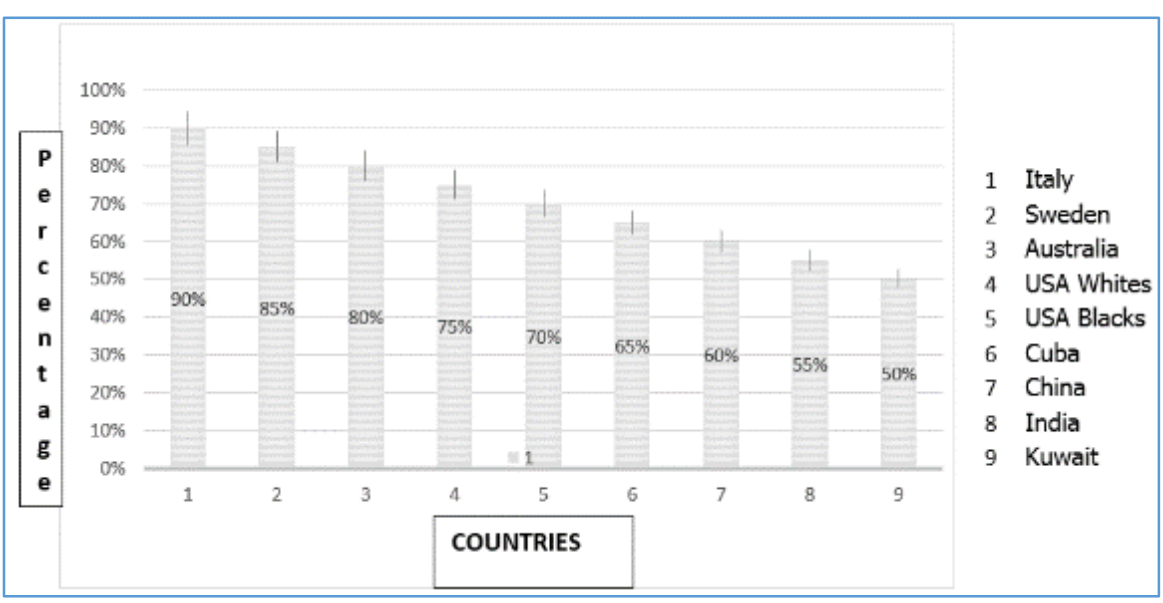
These reflect the growing interest of pathologists and clinicians in the field of paediatric oncology.

Incidence of Childhood Malignancies

The incidence as well as frequency of the various histological types of childhood cancer varies with age and sex.

	BOYS			GIRLS		
	0-4 Years	**5-9 Years**	**10-11 Years**	**0-4 Years**	**5-9 Years**	**10-14 Years**
All Sites	183.7	109.4	112.3	116.8	89.6	99.5
Leukaemias	69.0	33.3	26.5	58.6	30.7	17.7
Brain	25.3	28.4	22.0	23.7	23.5	19.1
Lymphoma	9.5	19.8	26.8	4.9	6.5	18.8
Kidney	15.5	4.6	1.4	19.4	7.1	1.4
Soft tissue	8.9	8.5	7.6	8.9	6.8	7.7
Bone	1.4	3.6	12.6	1.6	4.8	11.0
Retinoblastoma	9.9	0.7	0.1	12.1	0.4	--
Others	16.1	6.6	14.0	11.2	7.3	21.5

Table 1. Annual Incidence of Major Forms of Cancer in Children by Age and Sex



Incidence Rate of Childhood Malignancies Per Million

AIM

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MATERIALS AND METHODS

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The material was obtained from paediatric patients aged from 0-14 years admitted to Chigateri General Hospital, Bapuji Child Health Institute attached to JJM Medical College, Davangere, and Hospitals and nursing homes in and around Davangere. The clinical history regarding duration of the disease, mode of presentation, signs and symptoms were recorded in each case.

Specimens consisted of blood samples (Including peripheral smear and bone narrow aspirate smears), biopsies, partial or total resections with or without the draining lymph nodes of the region.

A through haematological evaluation was done in patients with leukaemias. This includes bone narrow examination as well as cytochemistry. Peripheral blood and bone marrow smears were stained with Fleishman's stain for morphological diagnosis and subtyping cytochemical stains employed were myeloperoxidase, PAS, Sudan black and acid elution technique of Kleihaur (In a case of J-CML). In solid tumours, surgical specimens were received in the department of pathology and they were subjected to careful and detailed gross examination. Size, shape, consistency, weight, external appearance and the appearance on cut section were noted. After this, the specimens were kept in 10% formation for 24-48 hours for fixation. Larger specimens were cut serially at a distance of 2-3 cm before fixing them in formalin. After fixation representative section were selected for paraffin embedding including the tumour proper and the margins of the tumour with surrounding tissue. Multiple blocks (Number depending on the size of the tumour and tumour morphology) from different areas of the tumour studied in each case. Multiple thin sections of 4-5 thickness were cut. The routinely used haematoxylin and eosin staining was done in all cases. Wherever necessary special stains were employed:

1. Periodic Acid-Schiff (PAS).
2. Reticulum stain.
3. PTAH (Phosphotungstic acid haematoxylin).

RESULTS

During the study period of 3 years from March 1994 to February 1997, total malignant tumours received in the department from patients of all ages were 2197, out of which 247 were tumours from the children up to the age of 14 years. These included 167 benign tumours and 80 malignant tumours.

Year	Total malignant tumours at all ages	Paediatric malignancies	% of Paediatric malignancies
From March 1994	747.001	26	3.48
1995	759	30	3.95
1996 Up to Oct	691	24	3.47
Total	**2197.00**	**80**	**10.9**

Table 2. Showing Incidence of Paediatric (Year Wise Distribution)

National cancer registry program. Annual report 1987 has shown the incidence of paediatric tumours in metropolitan cities like Bangalore and Bombay as follows.

Bangalore			Normal		Diseased	
Age	**Male**	**Female**	**Total**	**%**	**Total**	**%**
0-4	2,20,891	2,20,288	4,41,179	1.24	19	1.8
5-9	2,49,422	2,47,432	4,96,864	12.66	28	2.7
10-14	2,24,776	2,21,299	4,46,075	11.37	19	1.8
Total					**66**	**6.3**

Bombay			Normal		Diseased	
Age	**Male**	**Female**	**Total**	**%**	**Total**	**%**
0-4	5,12,592	4,98,404	1,01,0996	10.42	47	1.3
5-9	5,37,665	5,29,200	1,06,1865	10.95	42	1.2
10-14	5,19,395	4,90,838	1,01,0233	10.42	37	1.1
Total					**126**	**3.6**

Table 3. Incidence of Paediatric Tumours on Population-Based Study in Relation to Age and Sex

Site of Tumour Common sites involved were haemopoietic system followed by lymph nodes, eyes, bones, adrenals, metastatic lymph nodes, soft tissues and miscellaneous.

Site of Tumour	No. of Tumour	%
Haemopoietic System (Leukaemia's)	31	38.75
Lymphomas	13	16.25
Retinoblastoma (Eye)	7	8.75
Wilms Tumour (Kidney)	5	6.25
Ewing's Tumour (Bones)	5	6.25
Neuroblastomas	3	3.75
Metastatic Lesions In Lymph node	2	2.50
Miscellaneous	14	17.50

Table 4. Site of Tumour

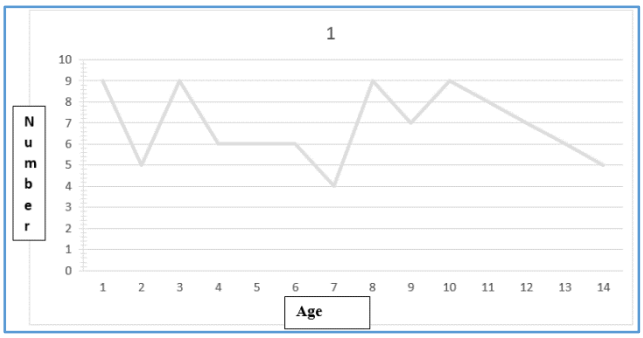
Types of Tumours

The commonest malignancies encountered in the present study were leukaemia's followed by lymphomas and retinoblastomas. Less common tumours were Wilms tumour, Ewing's tumour, neuroblastomas, rarely encountered tumours are shown in Table - 4.

Age Incidence

In the present study, all malignancies seen in childhood from 0-14 years were included. The mean age was 6-4 years. The majority of the tumours in this study occurred between the ages of 5-9 years with a mean age of 7.4 years. They constituted 36% of total tumours.

Retinoblastoma's was seen below 8 years and Wilms tumour below the age of 5 years. The youngest patient was 20 days old at the time of diagnosis who had an immature teratoma in retroperitoneum.



Age Incidence Percentage

Age in Groups	No. of Cases	%
0-4 Years	26	32.5
5-9 Years	29	36.0
9-14 Years	25	31.5

Table 5. Percentage of Tumours in 3 Age Groups

Sex Incidence

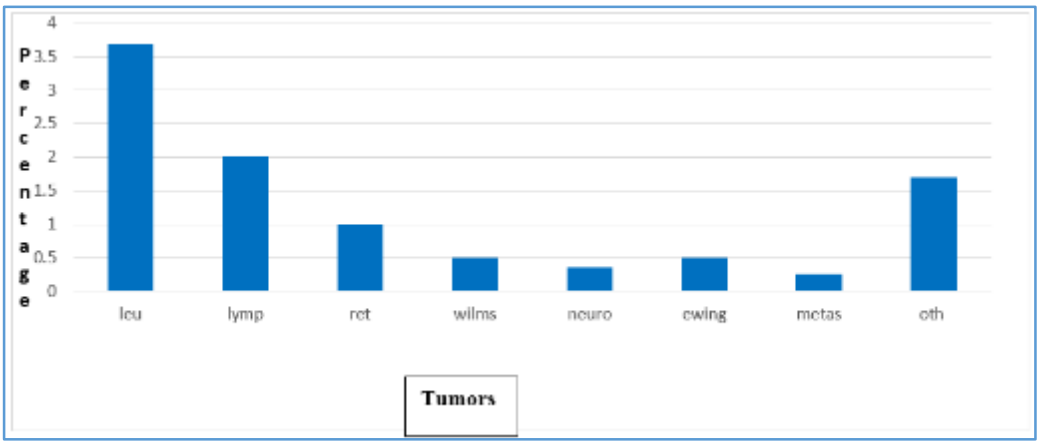
Male predominance was observed in the present study out of 80 malignancies, 47 occurred in males (55%) and 33 in females (45%) with a male-to-female ratio 1.2:1.

	0-11 Months	1-5 Years	6-10 Years	11-14 Years	Total
Male	4	17	18	9	48
Female	2	8	15	7	32
Total	6	25	33	16	80
%	7.5	31.25	41.25	20	100

Table 6. Incidence of Malignant Tumours at Different Age Group in Relation to Sex

Tumours	Age in Years				Sex		Total	% Age
	0-11 months	1-5 Yrs.	6-10 Yrs.	11-14 Yrs.	M	F		
Leukaemia	00	11	15	05	17	14	31	38.75
Lymphomas (HL)	00	01	02	01	03	01	04	5.00
(NHL)	01	01	05	02	05	04	09	11.25
Retinoblastoma	01	04	02	00	06	01	007	8.75
Ewing's tumour	00	00	02	03	02	03	05	6.25
Neuroblastoma	00	02	01	00	02	01	03	3.75
Wilms tumour	02	03	00	00	02	03	05	6.25
Germ cell tumour	00	01	02	00	01	02	03	3.75
Teratoma	02	00	00	00	02	00	02	2.50
Metastatic lymphoepithelioma	00	00	01	01	02	00	02	2.50
Soft tissue tumours								
A. fibrosarcoma	00	00	00	01	00	01	01	1.25
B. neurogenic sarcoma	00	00	01	00	00	01	01	1.25
Embryonal rhabdomyosarcoma	00	01	00	00	01	00	01	1.25
Adenocarcinoma of salivary Gland	00	00	00	01	01	00	01	1.25
PNET	00	01	01	00	02	00	02	2.50
Adrenal cortical ca	00	00	01	00	00	01	01	1.25
Epithelial (SQ, cell ca)	00	00	00	01	01	00	01	1.25
Malignant odontogenic sarcoma	00	00	00	01	00	01	01	1.25

Table 7. Malignant Tumours in Children in Relation to Age and Sex



Showing Incidence of Various Childhood Malignancies in Percentage

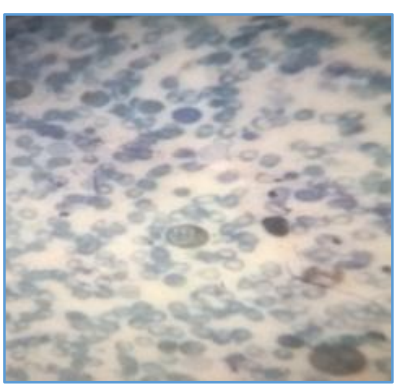
Leukaemias

Leukaemia's formed 36.34% of total malignancies studied. Most of the cases were acute type of which 53.33% were acute lymphoblastic and 33.34% were acute myeloblastic type. J-CML constituted 10% and CML formed 3.3%.

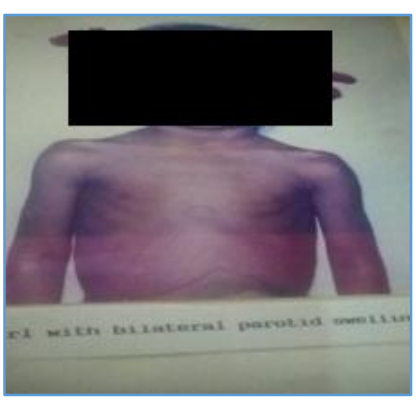
Diagnosis	Male	Female	Total	Percentage
ALL	7	8	15	48.38
AML	6	6	12	38.73
J-CML	3	0	3	9.67
CML	1	0	1	3.22

Table 8. Relative Incidence of Different Type of Leukaemia in Children

ALL - PAS Positive Lymphoblast PAS Stain

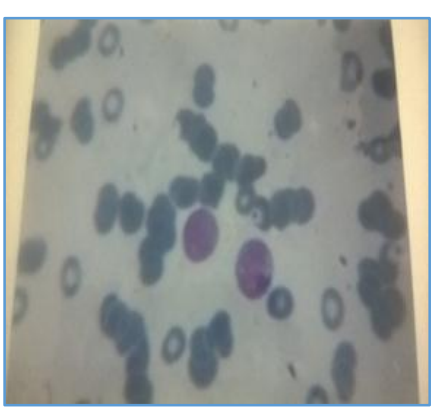


AML - Peroxides Positive Granules in Myeloid Cells MPO Stain

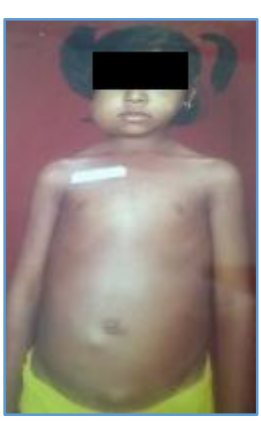


6-Year-Old Girl with Bilateral Parotid Swelling and Hepatosplenomegaly - AML

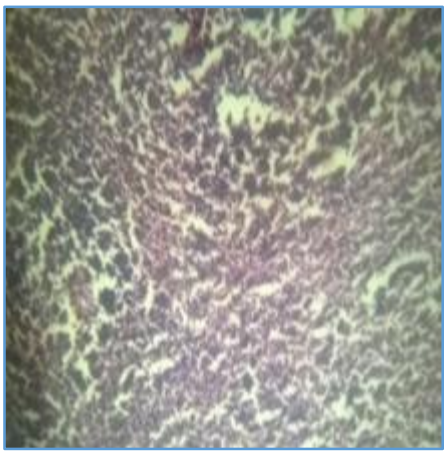
NON-HODGKIN'S LYMPHOMA



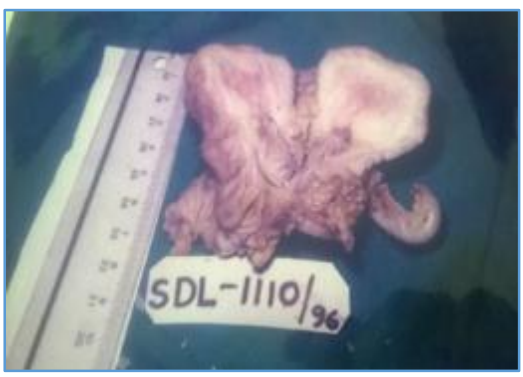
AML - Myeloblast showing Auer Rod Leishman Stain



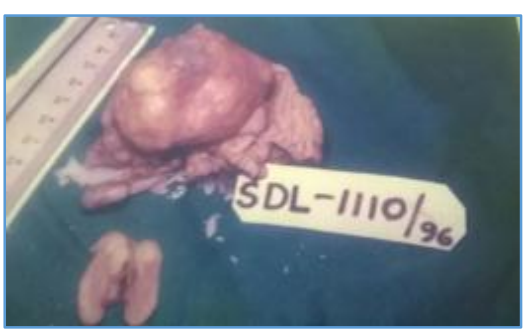
6-Year-Old Girl with NHL Showing Mandibular Swelling and Nodules over the Abdomen



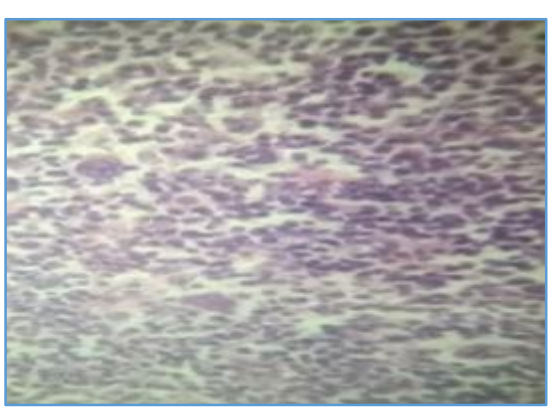
NHL - Small Lymphocytic Type



Cut Section of the Above Tumour showing Grey White Homogenous Areas



Ulceronodular Growth in Caecum with a Cut Section of Lymph Node - NHL



Hodgkin's Lymphoma showing eosinophilia and Hodgkin's Cells

Retinoblastoma

Cut Section of the Eyeball showing Grey White Tumour with Haemorrhage and Necrosis - Retinoblastoma

Ewing's Sarcoma

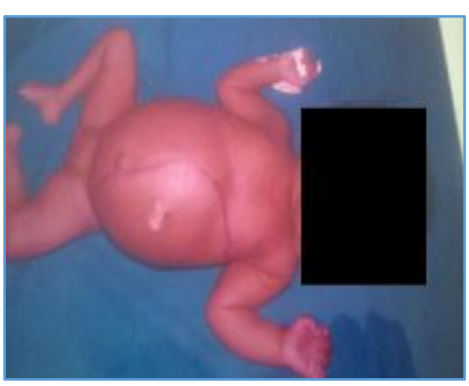
In the present study, five patients with Ewing's sarcoma were encountered constituting 6.25% of total malignancies, out of which 3 were females and 2 were males. Sites of involvement are:

a.	Lower end of humerus	1
b.	Swelling in the thigh (Soft tissues Ewing's)	1
c.	Maxillary bone	1
d.	Rib	2

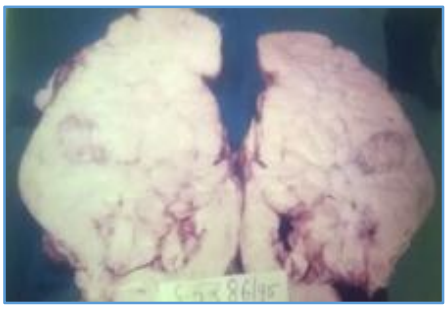
Histopathological examination in all cases revealed small round lymphocyte cells arranged in groups and sheets with areas of haemorrhaged and necrosis. Pseudorosettes were seen in 2 cases. PAS stain was useful in confirming the diagnosis.

Nephroblastoma

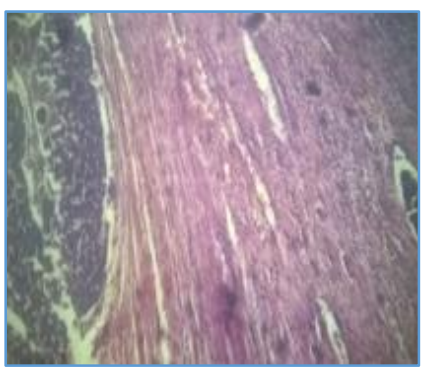
The nephrectomy masses varied from 12x10x9 cm to 10x8x7 cm. The cut section of the tumours showed grey white to grey brown solid areas with a focal cystic change with areas of haemorrhage and necrosis. Microscopically, the tumour showed cells separated by mesenchymal cells in all cases. The abortive glomeruli and tubules, rosette-like structures were seen in one case. Stroma was myxoid in another case. A satellite nodule was seen near the opposite pole in the same kidney in one case.



2-Months-Old Baby with Abdominal Mass - Nephroblastoma



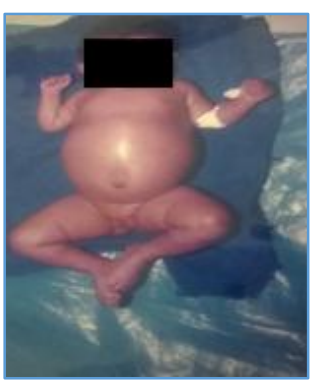
Cut Section of Renal Mass with Normal Kidney at One End with Grey White Tumour - Nephroblastoma



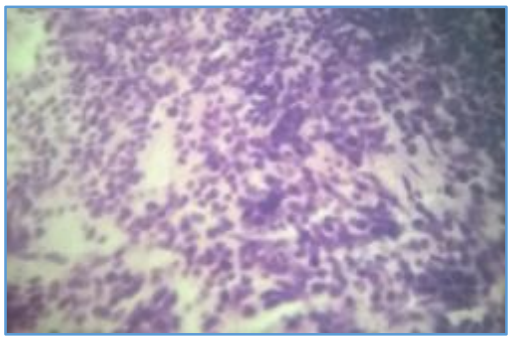
Wilms Tumour - Blastemal Component

Neuroblastoma

It is seen in 3 patients, which accounted for 3.75% of the total malignancies. Two were males and one was female. Only female patient presented with swelling in the right thigh and histopathological examination of resected mass showed peripheral neuroblastomas. Another patient (2-year-old male) presented with swelling in maxillary area and it was clinically diagnosed as rhabdomyosarcoma. Histopathological examination of excised mass revealed olfactory neuroblastoma. The remaining patient presented with multiple swelling over the right chest with right supraclavicular lymph node enlargement. Retractile testis was present on both sides. Clinically, it was diagnosed as pulmonary blastoma. Sampling biopsy of the swelling over the chest showed features of neuroblastoma. In all the cases, tumour cells are small round and lymphocytes like arranged in groups and sheets in back ground of fibrillary stroma.



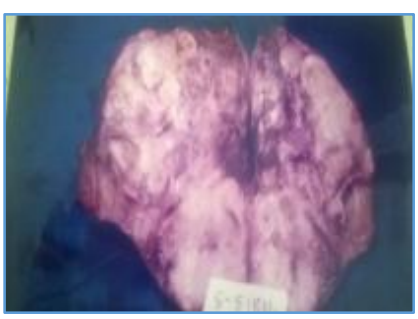
1-Month-Old Baby with Abdominal Mass - Neuroblastoma



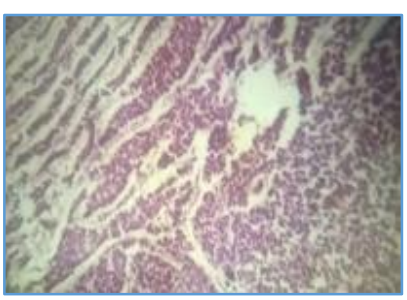
Neuroblastoma showing Small Round Cells with Mitosis

Germ Cell Tumours

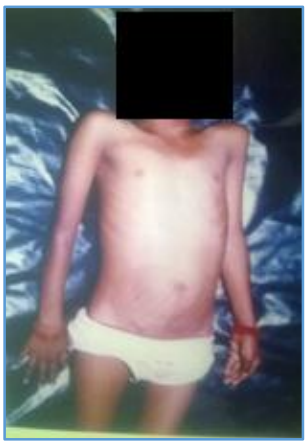
There were three malignant tumours in the present study, which included one boy and two girls. The boy was 3-year-old and presented with enlargement of left testis of 2 months duration, which was diagnosed as yolk sac tumour. A 13-year-old girl presented with left ovarian mass of 2 months' duration, which turned out to be an EST. The cut surface of both tumours showed areas of necrosis, haemorrhage and cystic spaces. Histopathological examination shows tumours cells arranged in reticular and solid patterns with Schiller-Duval bodies and hyaline droplets. Other girl 12 year old presented with right ovarian mass of 6 months duration. Operated ovarian mass measured 10x12x6 cm with cambium zone white-to-yellowish solid areas on cut surface. Histological examination showed groups of uniform round to polygonal cells having vesicular nuclei with nucleoli and abundant clear cytoplasm. These are arranged in groups and sheet separated by fibrovascular stroma infiltrated by lymphocytes. The diagnosis of dysgerminoma was offered.



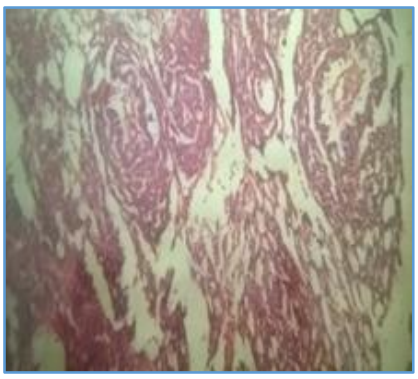
Cut Section of Specimen of Dysgerminoma - showing Grey White Areas, Haemorrhage, Necrosis and Cystic Change



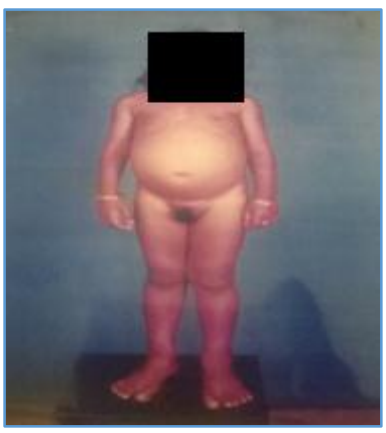
Dysgerminoma - Groups and Strands of Cells Separated by Scanty Stroma Infiltrated by Lymphocytes



11-Year-Old Girl with Lower Abdominal Mass - EST

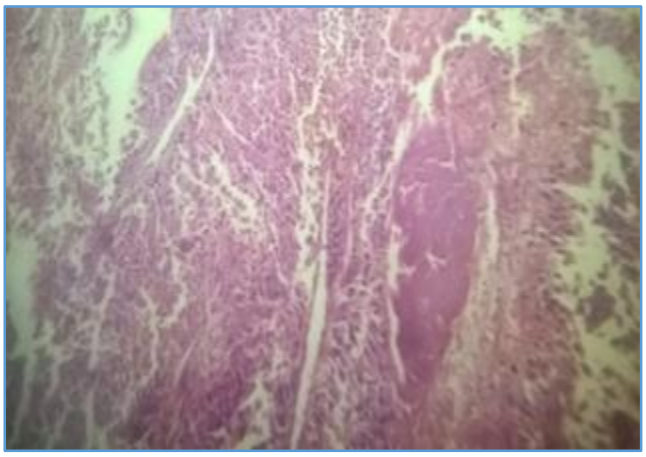


EST - with Schiller-Duval Bodies



6-Year-Old Girl with Adrenocortical Carcinoma with Public Hair and Hirsutism

Specimen from Above Patient - Grey White Nodular Tumour with Areas of Necrosis on Cut Section



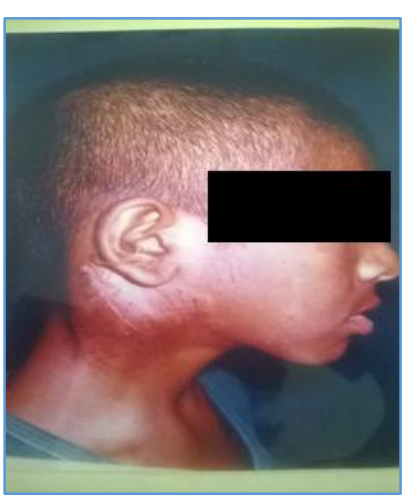
Adrenal Carcinoma with Oeosinophilic Cytoplasm

Teratomas

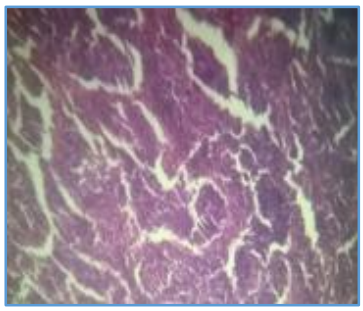
2 Patients with teratoma were encountered in the present study constituting 2.5% of the total malignant tumours. Both were males, one was 20 days old baby with retroperitoneal teratoma and other was one-month-old child with teratoma at sacrococcygeal region. Grossly, both were well-delineated tumours with bosselated external surface. The cut surface of the both tumours showed grey white solid areas with translucent foci and cystic spaces. Microscopic examination revealed presence of mature and immature cartilage with neuroepithelial rosettes in addition to brain tissues, muscle and glandular structures.

Lymphoepithelioma

In the present study, there were 2 patients with metastatic lymphoepithelioma involving cervical lymph nodes. Both were males, one was 10 year old and other was 14 year old. Both presented with enlargement of right cervical lymph nodes of 3 months duration. The limpness were excised and sent for histological examination showed syncytial groups of slightly large polygonal cells, epithelial like cells admixed with lymphocytes. Clinician was advised to look for primary in the oropharynx, tonsil and nasopharynx.



14-Year-Old Boy with Metastatic Lymphoepithelioma - Rt. Cervical Lymph Nodes (After a Lymph Node Biopsy)



Lymphoepithelioma – Syncytial Mass of Epithelial Cells – Lymph Node Metastasis

Soft Tissue Tumours

In present study, two malignant soft tissue tumours were encountered forming 2.5% of the total malignancy. One was juvenile fibrosarcoma presenting as mass in the right thigh of 6 months duration in a 12-year-old girl. Excised mass with tumour measured 7x5x5 cm with gray white to gray brown areas on cut surface. Histologically, the tumours was composed of plump spindle cells arranged in interlacing bundles and whorls with Herringbone pattern. Mitotic figures were numerous.

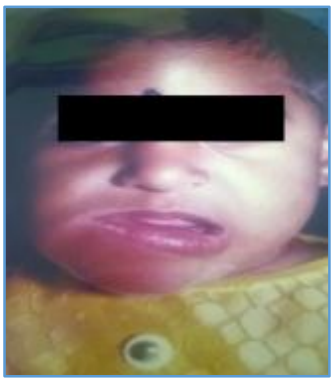
The other was neurogenic sarcoma in a 14-year-old girl presented as a gluteal mass. Histological examination showed interlacing fascicles of plump spindle cells having prominent oval to elongated nuclei with mitotic figures. Areas of geographical necrosis were seen.

PNET

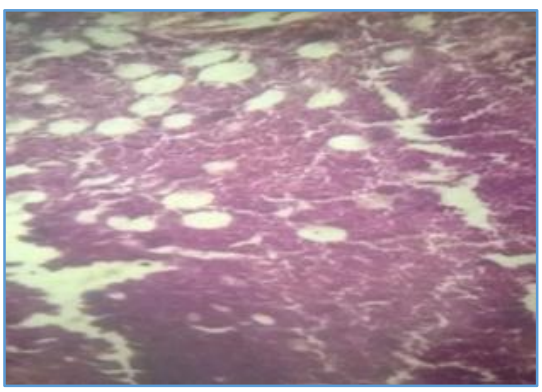
There were two patients with PNET in the present study constituting 2.5% of total malignancies. One patient was a three-year-old boy who clinically presented with swelling in the right maxillary region, proposes and chemosis in the right eye of 10 weeks duration. Skull x-ray showed erosion of the lateral and the roof of maxillary sinus. Clinically, it was diagnosed as Burkitt's lymphoma. FNAC suggested the possibility of Burkitt's lymphoma. Histopathological examination showed small round cells arranged in sheets separated by the thin fibrovascular septae. No rosettes, no areas of haemorrhage or calcification were seen, the PTAH was not contributory, so the diagnosis of PNET was offered. Another case, a female aged 2.5 year old presented with swelling in the lower part of right mandible diagnosis of prognoma was considered. Grossly, it was a sampling biopsy. Histologically, it showed small round cells arranged in groups and sheets with focal rosettes. No melanin or RS cells were seen. Special stains were inconclusive. So, the diagnosis of PNET was made.

One case of adrenal cortical carcinoma was encountered in the present study forming 1.2% of all malignancies. Patient was 6-year-old girl and presented with virilising symptoms such as excessive pubic hair, hypertrophy of clitoris and labia major and acne over the face.

Grossly, the tumours was well-delineated measuring 15x15x9 cm with a bosselated external surface. The cut surface was grey white with areas of necrosis. Histologically, tumours showed polygonal cells with eosinophilic granular cytoplasm and vesicular nuclei arranged in nests and sheets.



1-1/2-Year-Old Child with PNET - Swelling in the Mandible



PNET - with Perinodal Infiltration

Odontogenic Sarcoma

12-year-old male presented with swelling in the left jaw region associated with pain. Histological examination of biopsy tissue revealed a tumour composed of epithelial cells arranged in small groups and cords. There were also spindle cells with a typical mitotic figures. Focally myxoid change and pink material resembling dentine were seen, the diagnosis of odontogenic sarcoma was made.

Adenocarcinoma of Salivary Gland

Only one case of adenocarcinoma of salivary gland was seen in the present study constituting 1.2%. The patient was 13-year-old boy presented with left parotid mass and upper cervical lymphadenopathy. The resected mass measured 6x5x4 cm and lymph nodes were received. Microscopic examination of the mass revealed a tumour composed of solid group of epithelial cells, papillary and acinar structures with intraluminal mucin. Lymph nodes showed metastatic tumour deposits.

Squamous Cell Carcinoma of Skin

In the present study, only one patient with squamous cell carcinoma was encountered forming 1.2% of all malignancies. Patient was 11-year-old boy presenting with ulcerated growth in the scalp measuring 2x1.5x1 cm. Histologically, growth was composed of groups and sheets of atypical squamous cells with many mitosis. There were no epithelial pearls and only occasional cells with keratinisation was seen. It was diagnosed as poorly-differentiated squamous cell carcinoma of scalp.

Rhabdomyosarcoma

In the present study, 11-year-old boy presented with epistaxis and ulcerated growth in the nasopharynx of 2-month duration. Histopathological examination showed a polypoid tumour covered by respiratory type of epithelial tumour tissue composed of short spindle cells having plump nuclei and a cambium zone beneath the epithelium. PTAH stain revealed cross striations in the strap cells (With in the cambium zone). The diagnosis of embryonal rhabdomyosarcoma was offered.

DISCUSSION

With development of preventive and curative measures of treatment as well as fight against the malnutrition, an infection, the malignant tumours in the children have become second leading cause of death in development countries. Similar pattern is likely to emerge in India when the malnutrition and infection are eliminated. The malignant neoplasm of almost all types are being reported during early life. But, their common site of origin differ sharply from those adults; for e.g., the haemopoietic system, the nervous system, soft tissue tumours, bones and kidney tumours are common sites of origin of malignant tumours in infants and children. The common epithelial tumours of adults such as the carcinoma of skin, lung, breast, stomach and uterus are rare in early life.

The various malignant tumours in the childhood encountered in the present study are compared with similar tumours in other studies conducted in India and abroad. The comparison is made regarding the general incidence, incidence with reference to individual neoplasm, Age, Sex, Incidence and Pathology.

The present study comprises of 80 cases of malignant neoplasm in children from the samples received at the Department of Pathology. JJM Medical College, Davangere, from March 1994 to February 1997.

The malignant tumours in children are less frequent and account for 3.3% of malignant tumour occurring at all ages. Various types of malignant tumours are observed in the paediatric age group in the present study. The leukaemias being the commonest type followed by lymphoma, retinoblastoma, Wilms tumours and miscellaneous groups. In present study, the percentage of malignant tumours in children was 33.85% of the total paediatric tumours. The annual incidence was 11.28%. 38.75% occurred below the age of 5 years and 64.15% in the age group of 6-14 years. Similar findings were observed by some authors like Banerjee Dewani and Jusawalla.[1,2,3]

Sl. No.	Series	0-5 Years	6-10 Years	11-14 Years
1.	K. K. Jain	42.25%	22.25%	35.5%
2.	Index series	46.00%	29.00%	29.00%
3.	Dewani	47.2%	40.9%	11.9%
4.	Jussawalla	42.00%	29.00%	29.00%
5.	Present study	38.75%	40.00%	21.25%

Table 9. Showing General Incidence of Paediatric Malignancies in Relation of Age

It is apparent that some ethnic difference do exist in the occurrence of childhood tumours and there is an obvious need for good quality of data in the different parts of the world to evaluate these differences.

The overall incidence of malignant tumours of childhood was more in the males. (M:F = 1.2 L:1), but a significant male predominance was observed by few authors (Table - X). This may be due to the fact that only a small number of cases were studied when compared to the large studies by other authors.

Sl. No.	Author	Male	Female	Ratio
1	V. K. Pratap et al (1973)	100	62	1.6:1
2	Miller and Young (1975)	11,495	8,784	1.2:1
3	Jussawalla et al (1975)	444	306	1.43:1
4	Jain et al	30	15	2:1
5	Venugopal	60	45	1.3:1
6	Bazazmalik	105	53	1.93:1
7	Ramurthy	177	177	3:2
8	Present study	47 (55%)	3 (45%)	1.2:1

Table 10. Table showing the Incidence of Malignant Tumours in Relation to Sex

In the present study, Wilms tumour and retinoblastoma generally presented within 1 year of age as observed by the study done by K.K. Jain. There are reports of familial incidence of tumours such as retinoblastoma. In our study, positive family history of retinoblastoma was noted in 1 case. But, K.K. Jain has reported family history of malignancy in a case of Hodgkin's disease.

An increased incidence of congenital diseases has been noted in association with malignancies, e.g. Down's syndrome, Leukaemia, Immunodeficiency syndrome and Lymphoma. But, no such association has been noted in the present study and in the study conducted by K.K. Jain.

Leukaemias was the commonest malignancy found in children in the present study consisting 38.75% of the total malignancies. ALL being the commonest variety among leukaemias. The male predominance was seen. Similar observation is made by other authors also.

Authors	ALL	AML	CML	Others
Krishna Das et al	88.4	7.25	4.34	-
Miller and Dalager (1975)	62.5	15.97	2.30	19.32
Advani (1928)	72	20	8	-
Kushwatha (1978)	66.75	12.56	6.25	12.5
Magothra (1978)	68.75	12.50	6.25	12.5
Sashiprakash (1981)	68.42	28.94	2.64	-
Sudharani	62.34	24.30	5.00	7.24
Present study	48.38	38.73	3.2	9.67

Table 11. Showing Relative Incidence of Leukaemia's as Recorded by Various Authors

V. K. Pratap noted an alarming rise in incidence of leukaemia in children in last 3 decades. Lymphomas is the second commonest malignant tumours in the present study. Many authors have similar observation. In the present study, non-Hodgkin's lymphoma is more common than the Hodgkin's disease. This is correlating with studies made by Miller, Dalagar (1974) and Venugopal (1981).[4,5] Hodgkin's disease is a malignant tumour of lymph node characterised by the presence of Reed-Sternberg cells. Commonest site of involvement in this study was cervical lymph nodes. This observation correlates with study of Brich and V.K. Pratap.[6,7] Out of 4 cases of Hodgkin's disease, 3 were of nodular sclerosis type. This is in contrast to Goswamy et al (1980) Wright and Isakson (1981)[8,9] where the mixed cellularity was the commonest type.

Histological Types	Goswamy	Wright and Isaacson	Present Study
Predominance	4	2	0
Nodular Sclerosis	15	18	3
Mixed Cellularity	54	36	1
Lymphocyte Depletion	27	14	0

Table 12. Showing Subtypes of Hodgkin's Disease Observed by Various Authors

The next common tumours in the present study was retinoblastoma (7 cases), which formed 8.75% of total malignancies. Retinoblastoma is a rapidly growing fatal intraocular neoplasm of embryonal neuroectodermal origin. In the present study, 4 cases presented within 5 years of age. Right eye was affected more commonly than the left and was more common in males (5 cases). Similar observations are made by many authors like Srivatsava and Belagavi C.S.[10] Positive family history was obtained in 1 patient. Familial incidence was also observed by C.S. Belagavi. Bilaterity of the tumours and optic nerve involvement were observed by Suvarna Kumara,[11] Srivatsava;[10] no such findings were seen in the present study. Histologically, undifferentiated tumours without rosettes were the commonest variety as also observed by Suvranakumari, Srivatsava and Belagavi.[11,10] Only 3 cases of differentiated type with rosettes were seen in present study.

The nephroblastoma is a malignant tumour of primitive nephroblastic tissue. It is seen in 5 patients accounting for 6.25% of the total malignant tumours. It is one of the common abdominal tumours of infancy and childhood in different studies. The incidence rate of this tumour is fairly constant worldwide. The incidence of the tumour in US is 6% of all malignant tumours in childhood. All the tumours in the present study were encountered within the age of 5 years and presenting symptoms were abdominal swelling, except in 1 case, which had haematuria in addition. In the present study, 4 were females and 1 was male. The left kidney was more commonly affected than the right. While opposite findings were noted by some observers like Dewani, C.K. Bannerjee and Sunitha Sharma.[2,1,12] Histologically, in most of the studies,[12] it is triphasic pattern (60%). Similar features were observed in the present study also. In our study, the only bone tumour encountered was Ewing's sarcoma, which accounted for 6.25% of total paediatric malignancies. This is in contrast to Dewani and Banerjee[1,2] in which osteosarcoma was the commonest type.

Ewing's tumours study is a disease of childhood and diaphysis of the long bones are commonly affected. They are found more in India than western countries. The common age group affected is 5-15 years. But, in the present study, they were seen between 5-10 years age group. In the present study, 3 cases of neuroblastoma were encountered, two of them presented within 5 years of age. Male-to-female ratio was 2:1. The similar observation was made by Dewani, Marwaha, Mohan Mallyak.[2,13,14] The abdominal swelling was the commonest finding in the above authors study. But, in the present study, it occurred in the peripheral parts like mandible and nasopharynx.

The gonad tumours are uncommon in the childhood. Among gonadal tumours, tumours of germ cells are commonly encountered in children. In the present study, they formed 3.60% of total paediatric malignancies. Histological types were EST (2.40%) and Dysgerminoma (1.20%). EST occurred in a boy aged 3 years and a girl aged 9 year old, whereas dysgerminoma occurred in a girl aged 14 years old. Mark E. Weinblast (1982)[15] observed in his studies that dysgerminoma is an infrequent tumour of ovary in adults. But, it is the most common ovarian tumour in children. Gupta[16] studied 340 histologically diagnosed cases of ovarian tumour. 21 of whom were children. EST and dysgerminoma formed 1.18% and 3.53%, respectively.

Teratomas are congenital tumours present malignancies. Both the patients were aged less than one year. Similar incidence of malignancies like teratomas were observed by studies conducted by Jussawala.[3] In the present study, site of involvement was retroperitoneal and sacrococcyx. These common sites of occurrence were also observed by Bazaz Malik.[17] But, Berry C.A[18] noted that the sacrococcyx was the commonest site in his studies.

In the present study, Testicular Neoplasm (EST) formed 1.2% of the total paediatric malignancies. Timothy B. Hopkins noted that the commonest types of paediatric testicular malignancy was embryonal cell carcinoma.

In the present study, 2 cases of metastatic lymphoepithelioma involving right cervical lymph nodes were encountered, one at age of 9 years and other at 14 years. The primary was not able to make out as the patient could not be followed up. Miller and Dalagar (1969)[4] studied 15 cases of metastasising lymphoepithelioma, which accounted for 0.04% of total paediatric malignancies in his series. These observations clearly shows that children too are not except from developing secondaries.

3 soft tissue tumours were seen in the present study forming 3.75% of total paediatric malignancies. One was juvenile fibrosarcoma and other was neurogenic sarcoma. Both patients were females and lesions involved right thigh and right gluteal region respectively. Third case was embryonal rhabdomyosarcoma of right nasopharynx. John NN and Miller[19] in their studies on paediatric malignancies noted that malignant soft tissue tumours formed 8.8% of the total malignancies. But, in studies conducted by Banerjee and Walia,[1] malignant soft tissue tumours formed 14.3% of total malignancies. Out of which, 50% were embryonal rhabdomyosarcomas.

Neurogenic sarcoma was rarely encountered in the study conducted by Young and Miller[19] who studied malignant tumours in US children. PNET is an uncommon neoplasm of paediatric age group and irrespective of their primary site. They are derived from primitive neuroectoderm. The sites in the present study were right maxillary and right mandibular regions.

Adrenal cortical carcinoma is rare in childhood. In the present study, it formed 1.25% of total paediatric malignancies. In the present study, patient of ACC was a girl aged about 6 years and presented with virilising symptoms. Similar presenting features are also observed by P.D. Shenoy[20] where all 3 cases studied were females of less than 13 years old. Adenocarcinoma of parotid gland was encountered in a 13 years old boy forming 1.25% of total malignancies in present study. In the study by E. B. Castro,[21] mucoepidermoid was the commonest histological type, which is also the commonest type in study of Dewani.[2]

Squamous cell carcinoma is rarely seen in paediatric age group unlike in adults in whom it is common as studied by Altmann et al.[22] However, in the present study, one case (1.2%) was encountered. Patient was 11 years old boy presented with scalp lesion. K. Sagreiya[23] studied 896 paediatric malignant tumours of which 21 were epithelial tumour and 5 of them were from skin. In the present study, one case of odontogenic sarcoma of the mandible was encountered in a 1-year-old boy constituting 1.2% of total malignancies. This is in contrast to study by K.K. Sagrieya[23] where the incidence was 2.2%.

The difference in the incidence of the tumours in the present study and study conducted by other authors could be due to;

1. The number of cases studied are small compared to the large number of studies conducted by other authors.
2. The patients were referred to the higher centres directly.
3. Parent's ignorance.
4. The cost of further investigations.
5. The early onset and the embryonal nature of the major paediatric tumours suggest a prenatal origin and role of genetic factors.

CONCLUSION

- The malignancies in the childhood are a commonest cause of death in the west after the accidents, whereas in India it is the next common causes of death after malnutrition and infections.
- As the embryonal tumours have good prognosis, if diagnosed early and treated, if it suggested that the antenatal data regarding the aetiological factors and screening of children of such parents for the possible childhood tumours will help us to control and treat the childhood tumours well in advance.

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