

A Cytopathological and Histopathological Correlation Study of Benign and Malignant Paediatric Age Group Tumour

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ABSTRACT

Objective: Cancer is a rarity in childhood. It is a major cause of death in pediatric age group. Present study was aimed to evaluate role of cytology in diagnosis of malignancy in pediatric age group and correlate these finding with Histopathology.

Method: In present study, 100 cases of pediatric malignancy were studied under the age group 0-14 years in our series. Cytosmears made from material obtained by FNAC. In neuromalignant cases cytosmears were prepared by squash technique. Histopathology was done on lump removed by surgery. Stained by rapid papanicolou techniques, hematoxylin and eosin, and May grunwald giemsa stains. For histopathology, routine Hematoxylin and Eosin staining was done.

Result: Out of 100 cases, satisfactory aspiration was obtained in 87 (87%). Out of these, 87 cytosmears, the diagnosis was consistent with histopathology in 70 cases and not consistent in 17 cases. Therefore, an accuracy rate of 80.4% was obtained. Commonest malignancy was of kidney, mainly wilm's tumour (25%). Lymphoma was second common (22%) followed by soft tissue sarcoma (18%).

FNAC is feasible, rapid and inexpensive first approach in evaluation of cases of pediatric tumour but cytological diagnosis on FNAC is not a substitute for the histological

diagnosis on tissue section. In 0-5 yrs. age group, Kidney tumours were the commonest malignancy. In 5-10 yrs. age group commonest were lymphomas and in 10-14 yrs. age group soft tissue tumours formed the main type. Male preponderance was seen in all malignancies except malignant teratoma, gonadal tumours and neuroblastoma.

Keywords: Wilm's tumours, Lymphoma, FNAC.

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INTRODUCTION

Although cancer is a rarity in childhood; It is a major cause of death in pediatric age group. Its insidious onset, emotional & psychological impact, lethal nature and increasing prospects of cure due to advances in diagnostic pathology, surgery, radiotherapy and chemotherapy; make it one of the major challenging aspects.

One third of childhood cancer is due to leukaemia, Lymphomas, brain tumours and wilm's tumor account for the other more frequent types. The frequency of different pediatric tumours varies with age and this may be a useful diagnostic pointer. The majority of cases of embryonal tumours (Neuroblastoma, Nephroblastoma, hepatoblastoma, medulloblastoma, retinoblastoma) occur in children less than 5 years old, reflecting the origin of embryonal tumours from immature tissues. Lymphomas, bone tumours & germ cell tumours occur more frequently in the 10-12 years age group (Pratt., 1985).¹

For the lab diagnosis, various procedures like cytopathology, histopathology have been used since past with variable success rates. Histopathologists have contributed to the remarkable progress both directly by identifying new tumour entities with important therapeutic and prognostic implications & indirectly by submitting material to multicenter studies.

The present study is undertaken with an aim to evaluate the role of cytopathology and subsequently histopathology in diagnosis of tumours in pediatric age group. In Cytopathology diagnosis is made by study of cells and tissue fragments collected by needle aspiration is made of superficial or deep masses; and by squash smears where cytosmears are prepared by crushing tiny fragment of freshly removed surgical biopsy material. In histopathology, this surgical biopsy material is processed into paraffin blocks and then studied in H & E smears. The cytological findings are then correlated with histopathological appraisal.

This study is carried on various malignancies arising in pediatric age group (0-14 years) obtained by fine needle aspiration. Cytosmears prepared by squash in neuromalignant cases. Biopsy from lump surgically removed in cases of solid tumours.

MATERIALS AND METHODS

This study was done in SMS Medical College, Jaipur in Department of Patholgy. This study was carried on various pediatric malignancy (0-14 years). Cytology smear is immediately fixed in 95 % ethyl alcohol for a minimum period of 15 minutes and stained by rapid papanicolou techniques, hematoxylin and eosin, and may grunwald giemsa stains. For histopathology; routine Hematoxylin and Eosin staining was done.

- Hematoxylin crystals: 1 gm
- Distilled water: 100 ml
- Sodium iodate: 0.2 gm
- Ammonium potassium alum: 50.0 gm
- Citric acid: 1.0 gm
- Chloral hydrate: 50.0 gm

Cytosmears Made By Squash Technique

The method of squash technique adopted is that of Russel et al. (1937)². The biopsy material removed surgically is obtained. A small piece of biopsy material is cut with the help of a dissecting forceps and a scalpel. Cytosmear are made by placing the small tissue fragment on one slide and smearing it with gentle pressure using another slide. In this manner, a series of imprint smears are made. Smears are fixed immediately in 95% alcohol and stained by haematoxylin and eosin and papanicolau's stain.

OBSERVATIONS

In present study, 100 cases of pediatric malignancies are studied under the age group 0-14 years. The following observations were made. Total cases studied on cytological smears were 100. Failed applications were 13, Adequate aspirations were 87, out of these 87, constituent with histopathology were 70, non-constituent with histopathology were 17, accuracy of FNAC 80.4 % failure rate 19.6 %.

Commonest malignancy was kidney, mainly Wilm's tumours (25%) and a case of clear sarcoma of infancy. Lymphoma was at second place (22%) and soft tissue tumor (18%) at third place out of which majority were Ewing's sarcoma. Brain Tumours Constituted 12 %, Eye tumours 9%, Gonadal Tumours 5%, Neuroblastoma, Bone tumours and malignant teratoma accounted for 3 % each.

In 0-5 yrs. age group, Kidney tumours were the commonest malignancy. In 5-10 yrs. age group commonest were lymphomas and in 10-14 yrs. age group soft tissue tumours formed the main type. Male preponderance was seen in all malignancies except malignant teratoma, gonadal tumours and neuroblastoma.

In 0-5 year age group, out of 22 cases 19 were cytologically diagnostic for Wilm's tumour while three were negative. Therefore 86.3% cases could be correlated. In 5-10 year 100% correlation was obtained. Overall a correlation between cytology and histopathology was seen in 88% cases of wilm's tumour.

Table 1: Incidence of different type of malignancies

Malignancy types	No. of patients	Percentage (%)
Kidney tumour	25	25 %
Lymphoma	22	22 %
Soft tissue tumours	18	18 %
Brain tumours	12	12%
Eye Tumours	9	9%
Gonadal tumours	5	5%
Neuroblastoma	3	3%
Bone tumours	3	3%
Malignant Teratoma	3	3%
Liver Tumours	0	0%
Total	100	100

Table 2: Age wise Distribution of Malignancies

Age group (years)	No. of Patients	Percentage
0-5	54	54 %
5-10	33	33%
10-14	13	13%
Total	100	100

Table 3: Sex wise Distribution of Malignancies

Malignant Cases	MALES		FEMALES	
	Number	Percentage	Number	Percentage
100	70	70%	30	30%

Table 4: Age Incidence in different Malignancies

Malignancy types	No. of patients	0-5 yr.	5-10 yr.	10-14 yr.
Kidney tumour	25	22	3	-
Lymphoma	22	7	11	4
Soft tissue tumours	18	5	8	5
Brain tumours	12	3	5	4
Eye Tumours	9	8	1	-
Gonadal tumours	5	4	1	-
Neuroblastoma	3	3	-	-
Bone tumours	3	1	2	-
Malignant Teratoma	3	1	2	-
Liver Tumours	0	-	-	-
Total	100	55	34	13

Table 5: Different Types of Kidney Tumours

Kidney Tumours	No. of Patients	Percentage
Wilm's Tumour	24	96%
Clear Cell Sarcoma of infancy	1	04%
Total	25	100%

Table 6: Accuracy of Needle Aspiration in Kidney tumours

Wilm's Tumours	Total no. of cases	Cytology		Histopathologically Positive cases	No. Of cases correlated & percentage
		Positive Cases	Negative cases		
0-5 yrs	22	19	3	22	19 (86.3%)
5-10 yrs.	3	3	-	3	3(100%)
10-15 yrs.	-	-	-	-	-
Total	25	22	3	25	22 (88%)

Table 7: Lymphoma Cases

Lymphoma types	No. of Patients	Percentage
Hodgkin's disease	12	54.5%
Non-Hodgkin's Disease	10	45.5%
Total	22	100 %

Table 8: Accuracy of FNAC in cases of Hodkin's disease

Age Gr. (in yrs.)	Total no. of cases	Cytology			Histo. Positive for Hodkin's	No. of cases correlated
		Diagnostic of Hodkin's	Reactive hyper-plasia	Inadequate		
0-5	4	3	-	1	4	3
5-10	4	2	2	-	4	2
10-14	4	2	-	2	4	2
	12	7 (58.3%)	2(16.6%)	3(25%)	12	7 (58.3%)

Table 9: Accuracy of FNAC in cases of NHL

Age Gr. (in yrs.)	Total no. of cases	Cytology			Histo. Positive for NHL	No. of cases correlated
		Diagnostic of NHL	Reactive hyper-plasia	Inadequate		
0-5	2	1	-	1	4	1(33.3%)
5-10	8	6	1	1	4	5(71.4%)
10-14	-	-	-	-	4	-
	10	7 (70%)	1(10%)	2(20%)	12	7 (70%)

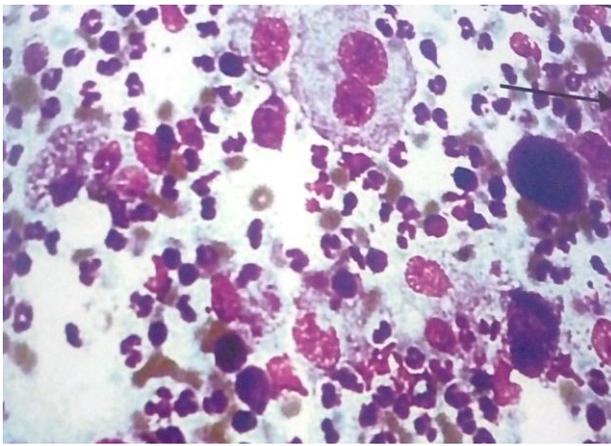


Fig 1: Hodgkin Lymphoma; Binuclear Reed Sternberg cells and mononuclear Hodgkin cells in a background of mainly small lymphocytes and granulocytes (MGG 100X)

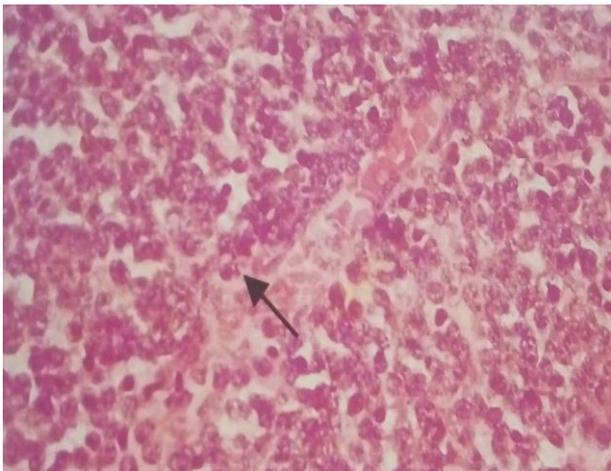


Fig 2: Medulloblastoma; Uniform malignant cell have very scanty cytoplasm and round or Ovoid basophilic vesicular with prominent nucleolus (H & E 40X)

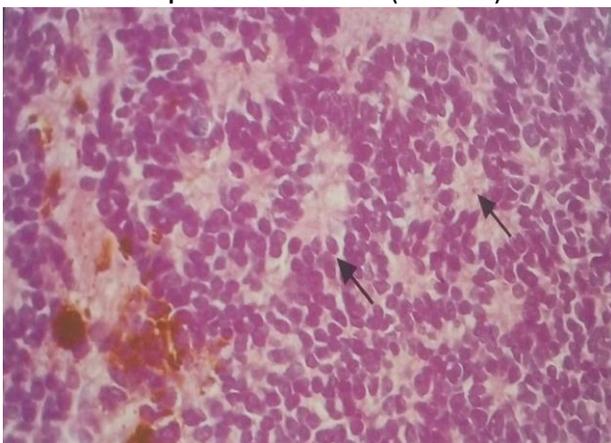


Fig 3: Retinoblastoma; Cells of uniform size and shape with scanty cytoplasm, nuclei are deeply basophilic and round or slightly ovoid. Rosette with central lumen full of eosinophilic fibrillary material (H & E 40X)

Hodgkin's disease was found in 54.5 % cases while non-Hodgkin's constituted remaining 45.5%. In 58.3 % of cases, cytological findings correlated with histopathology, 16.6 % cases were diagnosed a reactive hyperplasia while 25% smears were insufficient to conclude a diagnosis. In 70% of cases, cytologically smears were diagnosed as NHL which was further confirmed on histopathology.

18 cases of soft tissue sarcoma are obtained showing 12 cases of Ewing sarcoma. In 8 cases cytology was diagnostic, in 2 cases round cell were seen. In 2 cases aspiration was insufficient.

12 cases of brain tumour were seen. Out of these 11 cases show medulloblastoma and one case diagnosed as Ependymoma. 91.6% correlation was seen in all cases studied, between smears prepared by squash method and histopathology. 9 cases of eye tumour were obtained showing 78 % correlation with histopathology.

DISCUSSION

In present study, 100 cases of pediatric malignancy were studied under the age group 0-14 years. In our series, commonest malignancy was of kidney, mainly Wilm's tumour (25%) and a clear sarcoma of infancy. Lymphomas were at second place (22%). (Table 1) There was a preponderance of males being affected (Male:Female Ratio 2:3:1, Table-3). Majority of cases of embryonal tumours (Neuroblastoma, Nephroblastoma, Hepatoblastoma, Medulloblastoma, Retinoblastoma) were found to arise in 0-5 yrs age group, Lymphomas were more common in 5-10 yrs age group while bone tumour, soft tissue tumours and germ cell tumours were more commonly seen in 10-14 yrs. age group.

The results of fine needle aspiration cytology technique on comparison with histopathological findings, gave an accuracy rate of 80.4%. This finding was comparable with the results of workers like Taylor et al. (1984)³ and Layfield et al. (1991)⁴ who gave an accuracy rate of 76 % and 81% respectively.

Kidney Tumours

Wilm's tumour is the most common childhood tumour of the kidney. Kidney tumours accounted for maximum number of cases (25%). Our findings are comparable to the result obtained by workers like Alasio et al. (1988)⁵ and Bezabih⁶ whose accuracy rate varied from 76% - 95 %.

Most of the observations made in our series were similar to those of others. The aspirates were cellular with 79.1 % cytosmears showing presence of blastemal cells which were small round cells with uniform hyperchromatic nuclei, 50% had presence of epithelial cells and 83.3% showed mesenchymal cells corresponding to those noted by Beckwith & Palmer⁷.

Lymphomas

Hodgkin's disease was found in 54.5% cases while NHL constituted remaining 45.5%. (Table-8) In this study, in 58.3 % cases, smears were diagnostic of Hodgkin's lymphoma while 16.6% were false negative as the smear showed features of reactive hyperplasia while in 25 % of smears the aspirates consisted of few atypical lymphoid cells which indicated a primary lymphoid neoplasm but were insufficient to conclude a diagnosis and required further histopathological study. Thus, accuracy rate was 58.3 %. This finding is in accordance with an accuracy rate of 66.6%, reported by Nayer et al. (1990)⁸.

Non-Hodgkin's Lymphoma was seen in 45.5% of cases. In present series, in 70 % of cases FNAC smears were diagnosed as NHL giving an accuracy rate of 70%. These observations were comparable with previous study like Nayar et al.(1990).⁸

Soft Tissue Tumours

In our series, 18 cases of soft tissue tumours were aspirated. Out of these, 12 cases (66.6%) were diagnosed as Ewing's sarcoma, 2 as rhabdomyosarcoma and the other four cases were poorly

differentiated sarcoma whose exact histogenesis could not be ascertained (Table-11). This finding was in accordance with the observations of Dahl and Ackerman et al. who reported an accuracy rate of 71.4 %⁹.

Brain Tumour

12 cases of neuromalignant cases were diagnosed. There were 91.5 % cases of medullablastoma and 8.3 % cases of ependymoma.

Therefore an accuracy rate of 91.6 % was achieved. This was comparable with the observations reported by following authors:

Name of Author	Year	No. of cases	Accuracy rate
Cahill et al. ¹⁰	1985	32	91.7%
Torres LF et al ¹¹	1992	307	92.2%

Eye Tumour

Nine cases of retinoblastoma were diagnosed. The accuracy rate achieved on cytological diagnosis was 77.7%. Our findings were in accordance with the observations of workers like Elgert and savala et al. (1996) who reported an accuracy rate of 75 %.¹²

Histopathological findings in the nine cases studied, our series were also comparable to the finding reported by Eye Pathology Laboratory of Massachusetts Eye and Ear infirmary during period 1963-1976.

Histopathological Findings	% Specimens from MEEI	% Specimens from our study
Flexner Wintersteiner rosettes	55	55.5
Fleurettes	10	11.1
Calcification	78	66.6
Endothelial hyperplasia	53	22.2
Necrosis	51	77.7

Gonadal Tumour

Seven cases of gonadal tumour were studied. An overall accuracy rate of 71.5% could be achieved in diagnosing gonadal tumours by fine needle cytology. Our results were comparable with results reported by Verma et al. (1989) who reported an accuracy rate of 75%-86 %¹³.

Bone Tumour

Two cases of osteosarcoma and one case of Ewing’s sarcoma was studied. An overall accuracy rate of 66.6% was achieved; which was lower compared to the results of Walaas et al. (1990) who found an accuracy rate of 80%-95%¹⁴.

Neuroblastoma

Two Cytosmears were diagnostic. While one showed features of plemomorphic round cells. Histopathology sections confirmed the cytological finding in all 3 cases. Thus, accuracy rate was 66.6% which was comparable to results of Silverman et al. who gave an accuracy rate of 57.1%¹⁵.

CONCLUSION

Out of 100 cases, satisfactory aspiration was obtained in 87 (87%). Out of these, 87 cytosmears, the diagnosis was consistent with histopathology in 70 cases and not consistent in 17 cases. Therefore, an accuracy rate of 80.4% was obtained. Commonest malignancy was of kidney, mainly wilm’s tumour (25%). Lymphoma was second common (22%) followed by soft tissue sarcoma (18%). Brain tumour constituted 12%, eye tumour 9%, gonadal tumours (5%), neuroblastoma, bone tumour and

malignant teratoma accounted for 3% each. FNAC is feasible, rapid and inexpensive first approach in evaluation of cases of pediatric tumour but cytological diagnosis on FNA is not a substitute for the histological diagnosis on tissue section.

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