



## FINE NEEDLE ASPIRATION CYTOLOGY OF PAEDIATRIC SOLID TUMORS AND ITS HISTOPATHOLOGICAL CORRELATION.

### Paediatrics

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### ABSTRACT

Pediatric solid tumors compose wide range of lesions of various organs. It often causes diagnostic challenge in cytological diagnosis as well as in small biopsy. The present study was undertaken to evaluate role of the cytologic diagnosis of pediatric tumors and to compare with histopathology diagnosis. This study was conducted over a period of five years on 86 cases of pediatric solid tumors, which were evaluated by FNAC. Sensitivity, specificity and diagnostic efficacy were calculated using histopathology as gold standard. On cytological evaluation, malignant cases (74 cases, 86.05%) outnumbered the benign cases (12 cases, 13.95%). We found one false positive and four false negative cases in comparison to histology. Sensitivity and specificity of the present study were 94.59% and 92.31% respectively. Diagnostic accuracy was 94.31% in respect to correct diagnosis.. FNAC is proved as quick, economic and safe procedure in diagnosing ovarian masses with brilliant accuracy.

### KEYWORDS

Paediatric solid tumor, FNAC, histopathology.

### INTRODUCTION:

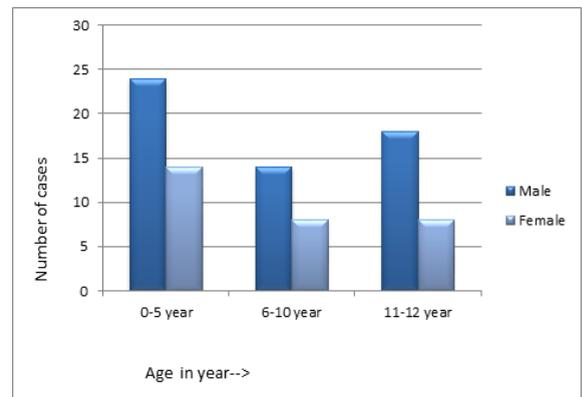
FNAC is a proven technique and become increasingly popular for diagnostic evaluation of the patients with both superficial and deep seated tumors.<sup>[1]</sup> FNAC is a minimally invasive, safe and quick diagnostic procedure.<sup>[1,2]</sup> FNAC helps in selecting the surgical planning in and management such as the need of a neoadjuvant chemotherapy. However, application of fine needle aspiration cytology (FNAC) to the pediatric population was slow in gaining popularity in comparison to adult patients.<sup>[1,2]</sup> Most of the earlier studies were only on smaller group series of pediatric population.<sup>[3]</sup> Distribution, subtypes, incidence and nature of pediatric tumors differ markedly from adult tumors.<sup>[4]</sup> Pediatric neoplasms often present diagnostic challenges, particularly in cytologic specimens and small biopsy.<sup>[5]</sup> The objective of the current review is to evaluate role of the cytologic diagnosis of pediatric tumors and to compare with histopathology diagnosis.

### MATERIALS AND METHODS:

The present study was undertaken including patients up to age of 12 years who attended outpatient department of Pediatrics, surgery, orthopedics and ENT etc with superficial and deep seated swelling/SOL. In our institute we conducted FNAC over patients during the study period of January 2011 to December 2016. Institutional ethical clearance was obtained. After taking written consent, all cases were undergone FNAC by 23-24 gauge needle attached with 10 ml syringe. Deep seated swellings (intraabdominal or pelvic) were aspirated with spinocaine needle (22-23 G) with image guidance (USG or CT scan). Smears were alcohol fixed and air dried. The smears were stained with Leishman – Giemsa and Papanicolaou stain routinely and special stains were used when required. After surgical biopsy, specimens were processed by routine histopathology procedure and sections were stained with hematoxyline and eosin stain. Cytological diagnosis of each cases was correlated with histopathological diagnosis. All cases of cyto-histological discrepancies were re-evaluated to find out the causes of cytological misdiagnosis and discrepancy. Statistical analysis was done by using SSPE version 22.

### RESULTS:

We evaluated 86 cases of pediatric solid tumor in our study period. The age of the patients were ranged from five months to 12 years with mean age of 6.62 years (figure 1).



**Figure 1: Age distribution of the cases of pediatric solid tumor**

Majority of the cases were seen in 0-5 years age group (38 cases, 44.18%). Male patients were predominant in the study population (56 cases, 65.11%) [M: F ratio 1.86: 1]. We found large number of malignant cases (74 cases, 86.05%) than benign neoplasms (12 cases, 13.95%). Most frequent organ approached by FNAC was kidney (24 cases, 27.9%) and least frequent organ subjected to FNAC was adrenal (1 case, 1.16%). Most common pathology diagnosed in cytology was Wilms tumor (16 cases, 18.6%). We diagnosed 13 cases of hematomalymphoid malignancy by FNAC and histopathology, among which most of the cases were non- Hodgkin's lymphoma (NHL) (12 cases out of 14). [table 1] One case was false positive in cytology and interpreted as NHL but confirmed as reactive hyperplasia in histopathology and immunohistochemistry. Most of the soft-tissue tumors were benign (5 cases of lipoma and 3 cases of neurofibroma). Three cases of embryonal rhabdomyosarcomas were diagnosed in the present study. We found 13 pediatric ovarian tumors and 3 testicular tumors in our study. Most of the ovarian tumors were malignant (11 out of 13 cases, 84.61%) and all testicular tumors were malignant. All the ovarian and testicular neoplasms were germ cell tumors and most frequent ovarian tumor was dysgerminoma (6 cases, 46.15%). We encountered 15 cases of bone tumors in our study period, among which 7 cases were Ewing's sarcoma and 8 cases were osteosarcoma. We approached three vascular lesions and diagnosed as lymphangioma (1 case) and cystic hygroma (2 cases).

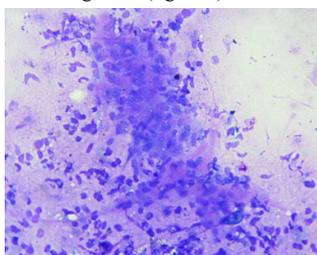
**Table 1: Cytology and histological diagnosis of cases of pediatric solid tumor.**

Organ involved	Number and Percentage	Histological diagnosis	Cytological diagnosis
Kidney	24 (27.9%)	Wilm's tumor (n-18)	Wilm's tumor (n-17)
		Neuroblastoma (n-6)	Neuroblastoma (n-5)
Hemato-lymphoid	14 (16.27%)	Non Hodgkins lymphoma (n-12)	Non Hodgkins lymphoma (n-13)
		Hodgkin's lymphoma (1)	Hodgkins lymphoma (1)
Soft tissue	11(12.79%)	Lipoma (5)	Lipoma (5)
		Neurofibroma (3)	Neurofibroma (3)
		Embryonal rhabdomyosarcoma (3)	Rhabdomyosarcoma (3)
Bone	15(17.44%)	Ewing's sarcoma (7)	Ewing's sarcoma (7)
		Osteosarcoma(8)	Osteosarcoma (7)
Ovary	13 (15.11%)	Mature teratoma (2)	Mature teratoma (2)
		Dysgerminoma (6)	Dysgerminoma (6)
		Yolk sac tumor (2)	Malignant Germ cell tumor (2)
		Immature teratoma (1)	Malignant Germ cell tumor (1)
		Mixed germ cell tumor (2)	Malignant Germ cell tumor (2)
Testis	3 (3.61%)	Yolk sac tumor (1)	Yolk sac tumor (1)
		Immature teratoma (1)	Malignant Germ cell tumor (1)
		Mixed germ cell tumor (1)	Malignant Germ cell tumor (1)
Blood vessels	3 (3.61%)	Lymphangioma (1)	Lymphangioma (1)
		Cystic hygroma(2)	Cystic hygroma (2)
Liver	2 (2.32%)	Hepatoblastoma (1)	Inconclusive
		Hemangioendothelioma (1)	Inconclusive
Adrenal	1 (1.16%)	Adrenocortical carcinoma (1)	Adrenocortical carcinoma (1)

Two liver swellings were approached by image guided FNAC but both were inconclusive in cytology. Histologically these were hepatoblastoma and hemangioendothelioma. We found one adrenal tumor one adrenal tumor, which was cytologically and histologically diagnosed as adrenocortical carcinoma. In comparison to histological diagnoses, we found four false negative and one false positive case in our series. Sensitivity and specificity of the present study were 94.59% and 92.31% respectively. Diagnostic accuracy was 94.31% and positive predictive value 99.78%.

## DISCUSSION:

In the present study we have evaluated the cytology of different pediatric tumors from various organs. Although infectious diseases are far more common than the neoplastic lesions but mortality rate is greater in childhood cancer. [5] FNAC is routinely used for evaluation of suspected neoplastic lesions in adults as well as in children. Ancillary techniques like IHC, flowcytometry also can be performed on the aspirated material. [4] Most common organ approached for FNAC in the present study was kidney (24 cases, 27.9%). In other similar studies lymphnode was most common site approached by FNAC. [14] We have selected the neoplastic cases only and this is the probable reason of discrepancy. Wilm's tumor was the most common pathology detected in the present series. The cytology of Wilm's tumor showed triphasic pattern of blastemal, epithelial and stromal elements along with rosettes and necrotic background (figure 2).



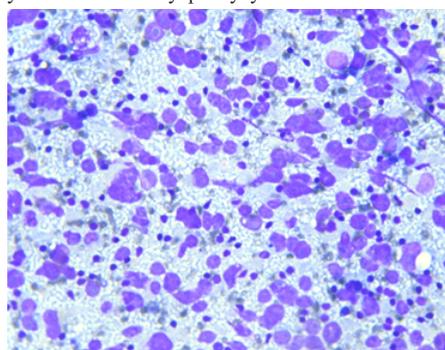
**Figure 2:** Photomicrograph of cytology of Wilm's tumor showing blastemal cells, epithelial cells and stromal cells in a necrotic background (Leishman and Giemsa stain, 40X view).

Blastemal component was found in all cases and stromal component was found in 14 cases similar to Alam K et al. [6] We have diagnosed 16 cases of Wilm's tumor with a sensitivity of 94.11%. Diagnostic sensitivity of 76 to 95% and specificity of 80 to 100% have been reported in previous series. [6] We have diagnosed 5 cases of neuroblastoma in our series. In cytology one case was inconclusive. Cytologically, neuroblastoma is difficult to differentiate from wilm's tumor. [7]

We diagnosed 14 cases of lymphoid neoplasm on cytology and most of them were non-Hodgkin's lymphoma (12 cases out of 14 cases, 85.71%). Lymphoma is the commonest type malignancy of lymph node in our study, supporting the findings of others. [8] Those studies have incorporated infectious and inflammatory causes, they found reactive lymphadenitis, suppurative and granulomatous lymphadenitis are more common causes of lymph node enlargement. [1] Maheswari et al found lymphoid malignancies as most common pediatric tumor. [4] In contrast, lymphomas were 2<sup>nd</sup> most frequent pediatric solid tumor in our study. On cytological diagnosis we have diagnosed smears from lymph node aspirates as a case of low-grade follicular lymphoma. However, the histopathology of lymph node proved to be reactive follicular hyperplasia. Similar mistakes have also been reported. [9, 10] Immunocytochemistry in this set-up is unique regarding the distinction of neoplastic and activated lymphocytes. [9, 10]

Among the soft tissue tumors, half of the cases were sarcomas (5 cases). In cytology two of the cases were diagnosed as rhabdomyosarcoma and other three were reported as small round cell tumor in cytology smears. In histology all the five cases were diagnosed as embryonal rhabdomyosarcoma (RMS). Rhabdomyoblastic differentiation with presence of floret cells and strap cells in cytology help to differentiate from other small round cell tumors (SRCT). [5] However immune markers like myogenin and Myo D1 help to distinguish in cytochemistry and IHC.

Among pediatric ovarian tumors, dysgerminoma was most frequent type in our series, comparable with Mukhopadhyay et al and Akyuz C et al. [11, 12] In our study, all the ovarian tumors were germ cell tumors. Cyto-diagnosis of dysgerminoma was 100% specific in the present series. Cytologically dysgerminomas are composed of dispersed malignant germ cells along with lymphocytes in a hypercellular smears (Figure 3). We found three cases of yolk sac tumors, two mixed germ cell tumors and two immature teratomas in histology. But all of the non-dysgerminomatous germ cell tumors were diagnosed as malignant germ cell tumor and further categorization was difficult. Similar experience was explained in studies of cytology of ovarian tumour by Pal et al and Bandyapadhyay et al. [13, 14]



**Figure 3:** Photomicrograph of cytology of Dysgerminoma showing dispersed malignant germ cells and lymphocytes in a tigroid background (Leishman and Giemsa stain, 40 X view).

We found seven cases of Ewing's sarcoma in the series. Cytology revealed dual cell population of small round cells with vacuolated cytoplasm and dark stained cells with small nuclei, dense chromatin and narrow rim of cytoplasm. [15] PAS (Periodic acid Schiff) reactivity and diastase sensitivity is also another distinguishing feature. Many of the previous authors emphasized that though FNAC is a successful diagnostic modalities, confirmation needs ancillary investigations for proper diagnosis. [2, 16] In cytology, we have diagnosed one case of lymphangioma and two cases of cystic hygroma. Aspirates of all the case were straw colored fluid. The smears were prepared from centrifuged deposit and smears show mature lymphocytes in a thin proteinaceous material. Our findings were consistent with Shahi et al. [17]

Sensitivity and specificity of the present study (94.59% and 92.31% respectively) are comparable with Gangopadhyay et al (sensitivity 100% and specificity 90%) and Maheshwari et al (Sensitivity 95.8% and specificity 97.6%).

#### CONCLUSION:

FNAC is thus a very important and valuable method for diagnostic evaluation of pediatric solid tumors. Though it can't replace open surgical biopsy but can help in primary diagnosis and follow up. However, in present era it needs to be supplemented by immunohistochemistry to pinpoint the diagnosis & grade the tumours more precisely.

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