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ORIGINAL ARTICLE

A STUDY OF LUNG PATHOLOGY IN PEDIATRICS AUTOPSIES: AN 8 YEAR STUDY

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ABSTRACT: BACKGROUND: Pneumonia remains the number one killer of children, taking the lives of 1.3 million in 2011 alone. More than 99% of all pneumonia deaths occur in developing countries. The majority of pneumonia cases are preventable and treatable, but clinical diagnosis is highly fallible in many cases and the frequency of morbid state is best assessed by post-mortem examination that may reveal diagnosis which may not be suspected clinically or may, in some way, discredit. **AIMS:** 1. To ascertain various pulmonary lesions in paediatric deaths. 2. To find incidence of pulmonary lesions. 3. To study the incidence of pulmonary tuberculosis, 4. To find incidence of pulmonary pathology directly and indirectly contributing to the death. **SETTINGS:** Lokmanya Tilak Municipal General Hospital, Sion, Mumbai. **DESIGN:** A retrospective observational study. **METHODS AND MATERIAL:** In this study pediatric age group of (0-15 years) admitted in IPCU,NICU and Pediatric, Medicine and Surgery unit are included from the period of 2006-2013. The lung pathology in various diseases entities were studied and co-related with age, sex and clinical history. **RESULTS:** Of total 3606 autopsies, 642 were pediatric autopsies i.e. 17.8% of all autopsies, and 111 were neonatal autopsies. Of 642, 531(82.7%) had primary lung pathology and 157(24.4%) had secondary lung pathology. The common age group affected is < 5 years. Bronchopneumonia was the commonest pathology observed as primary lung pathology. Interstitial/viral pneumonia was 2nd most common of primary lung pathology Infective pathology was the most common lesions, of which bronchopneumonia was the most common pathology observed and tuberculosis contributed to 3%of primary lung pathologies. **CONCLUSION:** The most common lung lesion in pediatric age is infections, which are preventable and curative with appropriate measures. This study will help to improve mother child health services.

KEYWORDS: Autopsy, Acute respiratory distress syndrome, atelectasis, bronchopneumonia, sudden infant death, intrapulmonary hemorrhage, meconium aspiration, neonate lesions, pneumonia, pediatric autopsy, tuberculosis.

INTRODUCTION: The 2000-2010 decade brought a significant reduction in overall child mortality, from 9.6 to 7.6 million. Pneumonia remains the number one killer of children, taking the lives of 1.3 million in 2011 alone. More than 99% of all pneumonia deaths occur in developing countries.[1] India lost 436 children below five years per 1000 live births in 2013 due to pneumonia and diarrhoea. The majority of pneumonia cases are preventable and treatable, but clinical diagnosis is highly fallible in many cases and the frequency of morbid state is best assessed by post-mortem examination that may reveal diagnosis which may not be suspected clinically or may, in some way, discredit.

In addition to ascertain clinico-pathological differences, the development of new understanding of old diseases and provision of opportunity to discover new diseases.[1, 2] So this study was undertaken at Lokmanya Tilak Medical College And General Hospital to ascertain various

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pulmonary lesions in paediatric deaths, to find incidence of pulmonary infections with an attempt to study the incidence of pulmonary tuberculosis. And to find incidence of pulmonary pathology directly and indirectly contributing to the death.

MATERIAL & METHODS: In this study autopsy cases of pediatric age group of (0-15 years) admitted in IPCU,NICU and Pediatric, Medicine and Surgery unit are included from the period of 2006-2013.Gross description of the lungs studied and they were preserved in formalin for adequate duration. After preservation, 5 sections from each lobe of the lung and additional sections if required were taken. Sections studied by using Haematoxylin and Eosin stain and special stain like Gomori's Methenamine Silver, Periodic Acid Schiff stain were used wherever indicated.

Case histories were retrieved by going through indoor case papers. Retrospective pediatric autopsy cases were studied by using autopsy notes, blocks and slides. The lung pathology in various diseases entities were studied and co-related with age, sex and clinical history. All medico legal autopsies having history of fall, trauma, poisoning and burns were excluded. Lung pathology divided as per age group into 4 categories- Neonatal, Infant, 1-5 years and 5-15 years. These were divided as primary pathology directly contributing to death or secondary pathology not directly contributing to death, which included infective and non-infective lesions.

RESULTS AND OBSERVATIONS: The present study included pediatric autopsies conducted over a period of 8 years. The total number of autopsies done including adult and pediatric, in our institution was 3606, out of which pediatric autopsies were 642 contributing 17.8% of all autopsies. Out of this neonatal autopsies were 111 (3.04%). The male to female ratio in our study is 1:1.2, with slight female predominance. The age distribution of autopsy was 111 cases of 0-1 month age, 265 cases in 1-12 month age group, 139 cases in 1-5 year age group and 128 in 5-15 year's age group.

The infective lesions and non-infective lesions are shown in the graph no.1 and 2 respectively. The most common infective lesion in both primary and secondary is bronchopneumonia (146+36=182/382) and interstitial pneumonia (94+26=120/382) contributing 47.6% and 31.4% respectively.

The most common non-infective lesions were intrapulmonary hemorrhage (IPH) and Acute Respiratory Distress Syndrome (ARDS) as primary and secondary lung pathology, IPH contributing (93+31=124/257 cases) 48.2% and ARDS contributing (49+8=57/257) 22.1%. The age distribution is shown in the table no.1 below. The most common age group affected by the infective and non-infective lesions was between 0-5 years of age. (552/683) cases.

The incidence of various lesions like bronchopneumonia (figure no.1) in present study was found in age group less than 5 years as 89% and with male predominance. In 5-15 years age group incidence of bronchopneumonia was found to be 11%.However we couldn't find the exact bacteriological agent as we didn't have culture studies. The predisposing factors in primary lung pathology were malnutrition, lack of breast feeding history of measles.

The complications of pneumonia like emphysema, lung abscess, pleural effusion was noted in this study, atelectasis was also noted which may be ventilator associated complication. The bronchopneumonia was found to be secondary lung pathology contributing to death in 37 cases which included like gastroenteritis(9), pyogenic and viral meningitis(7), congenital heart disease(7), encephalitis(3), 1 case each of hydrocephalus, peritonitis, glomerulonephritis, Hirschsprung's

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disease, peritonitis, anemia, leukemia, intussusceptions, cirrhosis. Similar study conducted by Igor Rudan Cynthia Boschi-Pinto et al bronchopneumonia was most commonly associated with heart disease, and rarely with asthma, gastroenteritis and congenital diseases.[3]

In present study interstitial pneumonia/viral pneumonia (figure no.2) is 2nd most common cause of lung after bronchopneumonia. Age group affected is < 1 year i.e. 79 of 94 cases. In a study done by R. Virkki et al maximum incidence was found in age group <2 year.[4] It constitutes 17.7 % and 16.5 % of primary and secondary lung pathology respectively. In primary lung pathology causes of interstitial pneumonia also included one case each of Cytomegalovirus induced pneumonia, adeno virus induced pneumonia and pneumocystis carini. (figure 4, 5, 6).

In 26 cases interstitial pneumonia was seen as the secondary lung pathology which included gastroenteritis(11), myocarditis(4) 2 cases of pyogenic meningitis and cyanotic heart disease and 1 case each of hydrocephalus,encephalitis,hirschsprung,encephalitis,enterocolitis,hydrocephalus and bronchiolitis. The incidence of tuberculosis (figure no.3) in present study is 3.5 %. Out of 19 cases 13 under 5 years of age and of these 13, 11 were having severe form of tuberculosis like milliary and disseminated TB. Milliary tuberculosis involved only lung in one case and other cases it involved organs in decreasing order like CNS, lymph nodes, spleen, liver.

In disseminated tuberculosis most commonly involved was lung then liver, spleen, lymph node, CNS, intestine. CNS was involved more commonly in milliary TB (5 of 7 cases) than disseminated TB (3 of 7 cases).Incidence of lung abscess was 1.1% and 1.2% in primary and secondary lung pathology, with the advent of antibiotics therapy the incidence has reduced. All the primary lesions (6 cases) were associated with underlying bronchopneumonia, while 2 secondary lesions were associated with pyogenic meningitis and gastroenteritis.

Incidence of IPH in primary and secondary lung pathology is 17.5% and 19.7%.Causes of IPH is varied; most commonly was sepsis (61%). The causes of primary and secondary IPH are illustrated in graph no.3 and graph no.4. There is a single case of pulmonary hemosiderosis secondary to glomerulonephritis. In study by Nadorra et al 18 of the 26 cases of SLE had lung involvement in form of alveolar hemorrhage and 8 cases had alveolar hemosiderosis.[5]

Neonatal lesions require a special mention as these lesions are unique to this age. Results are illustrated in graph no.5. As a contrast to earlier studies the incidence of Hyaline membrane disease (HMD) is reduced, probably secondary to surfactant therapy and positive pressure ventilation. Primary ARDS (figure 8) was associated with sepsis in 51% (25 cases) Secondary causes of ARDS were encephalopathy, encephalitis, acyanotic heart disease, myocarditis, gastroenteritis, glomerulonephritis and cystic disease of kidney. We came across a single case of amniotic fluid aspiration induced pneumonia (figure7).

In present study incidence of pulmonary edema was 5% and 12.7% as primary and secondary lung pathology respectively.10 cases of pulmonary enema in primary lung pathology were associated with pneumonia, the remaining 17 cases was undetermined. 20 cases of secondarily pulmonary edema was associated with gastroenteritis(7),congenital heart disease (4), 2 cases each of pyogenic meningitis and myocarditis and 1 case each of cardiomyopathy, aortoarteritis, cirrhosis, anemia, hepatic neoplasm.

Other lesions included 13 cases of atelectasis, out of which 9 were primary lung pathology which were accompanied by idiopathic (4), bronchopneumonia (3), foreign body aspiration (1), pleural effusion (1) and remaining 4 cases were secondarily associated with gastroenteritis. 17 cases

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of meconium aspiration (10.8%) of all neonates' death, consistent with Banerjee et al which have 15% of neonate deaths.[6] There were 2 cases of fungal infection; both were of aspergillosis (figure 9). Immune status of these patients was unknown. 4 cases of acute lymphoblastic leukemia having leukemic infiltration (figure 10) in the lung. 4 cases of pulmonary hypoplasia were seen, of which a case was associated with congenital diaphragmatic hernia.

DISCUSSION (Table No.2): From the below table it is seen that the incidence of neonatal autopsy is much less as compared with S R Dalal as majority of the time parents and relatives are reluctant for the autopsy.[7]The incidence of bronchopneumonia is also high in our hospital as compared to other studies as it caters a population which dwells in slums where there is high percentage of children who are not immunized or malnourished.

There were only 8 cases of lung abscess in our study, which shows that the complications secondary to pneumonia have reduced because of better antibiotic therapy. IPH was the most common non-infective pathology in all age group. The neonatal incidence was comparable to other studies as shown in table. In our study sepsis was the most common cause of IPH, which in contrast to the western study, Coss Bu et al, congenital lesions were leading cause of IPH.[8] Leptospirosis contributed 2 cases in the etiology of primary IPH, as compared with Nicodemo et al 8 0f 12 cases of IPH was secondary to leptospirosis.[9]

CONCULSION: The majority of primary lung pathology were infective in etiology. The common age group affected is < 5 years. Bronchopneumonia was the commonest pathology observed as primary lung pathology. Interstitial/viral pneumonia was 2nd most common primary lung pathology. The most common pathology in neonatal death was IPH (27.9%), bronchopneumonia (19.8%) and HMD (17.1%).

Tuberculosis contributed 3.5% of primary lung pathology, showing different morphological patterns. 82%(531 of 642 autopsies) of primary lung lesions were and 23%(150 of 642 autopsies) of secondary lung lesions were contributing to morbidity. Thus the most predominant cause of death in paediatric age is pulmonary infections, which are preventable by improving nutrition, better immunization and educating mothers and making them aware regarding environmental hygiene. National Health Programmes should be targeted towards early detection and appropriately treatment of Infections to prevent child mortality.

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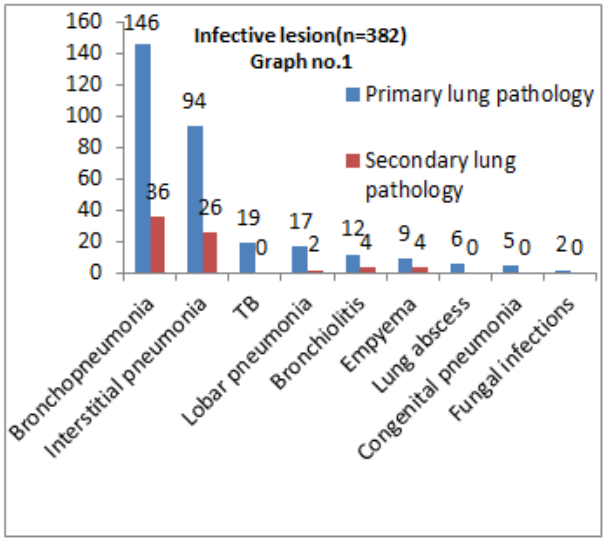

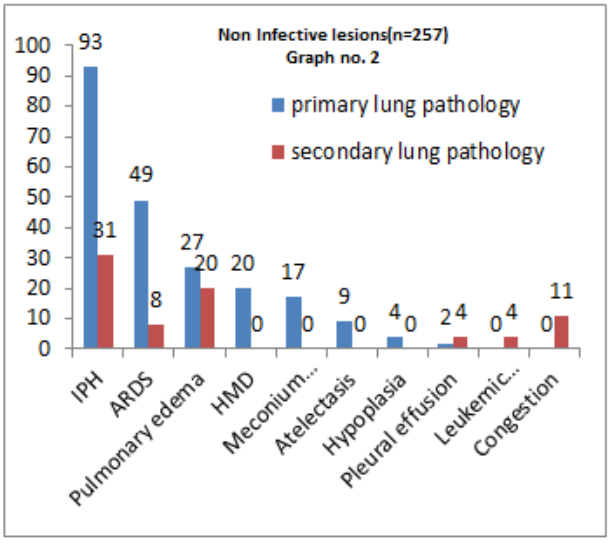

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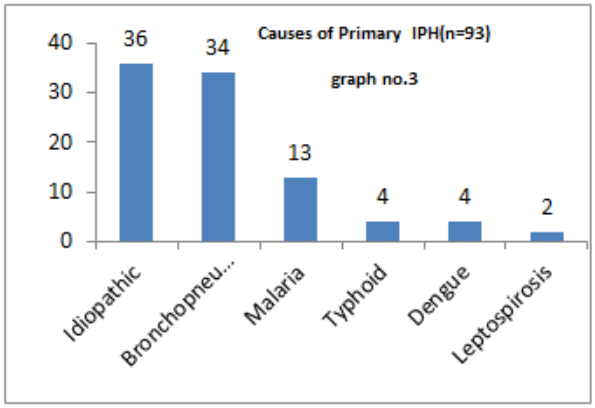

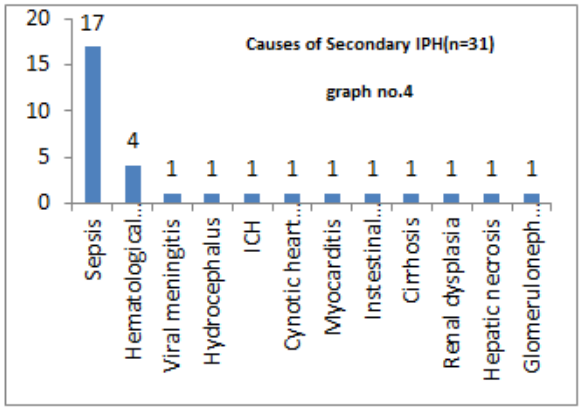

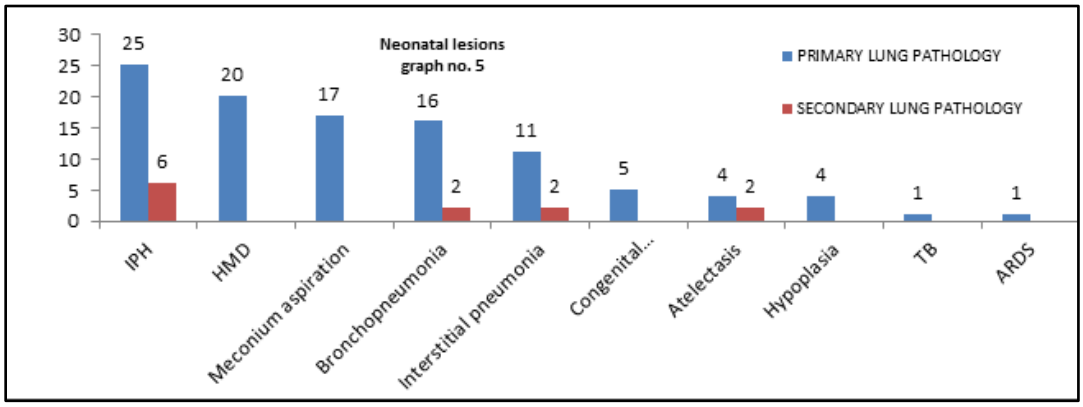

LUNG PATHOLOGY (n=683)	0-1 MONTHS n=117	1-12 MONTHS n=280	1-5 YEARS n=155	5-15 YEARS n=131
INFECTIVE LESIONS n=382				
Bronchopneumonia (182)	18	91	46	27
Interstitial Pneumonia (120)	13	81	18	8
TB (19)	1	4	8	6
Lobar pneumonia (19)	0	7	9	3
Congenital pneumonia (5)	5	0	0	0
Empyema (11)	0	5	5	1
Bronchiolitis (18)	0	9	7	2
Fungal infections (2)	0	2	0	0
Lung abscess (6)	0	2	2	2
NON INFECTIVE LESIONS n=303				
IPH (124)	31	31	23	39
ARDS (57)	1	25	14	17
Pulmonary Edema (47)	1	15	11	20
Pleural Effusion (6)	0	3	3	0

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Atelectasis (13)	6	2	4	1
Congestion (11)	0	2	4	5
Leukemic Infiltration (4)	0	1	2	1
Hyaline membrane Disease (20)	20	0	0	0
Meconium Aspiration (17)	17	0	0	0
Pulmonary Hypoplasia (4)	4	0	0	0

Table 1: Age distribution of infective and non-infective lesions of the lungs

DISCUSSION:

Sl. NO.	PRESENT STUDY	COMPARATIVE STUDIES	
1.	Total no. of pediatric autopsies-652/3606(17.7%) No. of neonatal autopsies-11/3606(3.04%)	S R Dalal[7]-441/1445(30.5%), 70.5%	
2.	Incidence of bronchopneumonia in <5 years(155/182) -89% >5 years(27/182) -11%	C. Jokinen et al [10] <5 years- 36 per 1000 >5 years- 16.2 per 1000	Ramchandran et al[11] <5 years 8.5%
3.	Tuberculosis Age of occurrence <5years (13 of the 19 cases)	N Vitthalani and P Udani[12] <3 years	
4.	Lung abscess No. of cases associated with bronchopneumonia- 6 of 8 cases	Thomas C Moore et al 1934-1959[13] 12 of 18 cases	
5.	Intrapulmonary hemorrhage Neonatal incidence- 26.8% Causes Sepsis/infectious 57 Congenital 1	Banerjee et al -13%[6] S Y Sane BM Patel - 20%[6] Coss Bu et al[4] Infectious 16% Congenital 46% Neoplasm 8 % Others 14%	
6.	Acute Respiratory Distress Syndrome Neonatal incidence 27.2% Causes Sepsis-51%	SY Sane BM Patel -30.5%[6] P. Dahlem et al- 34%[14]	
7.	Atelectasis due to bronchopneumonia-3/19 cases	T.S. Raghu Raman et al-14 of 35 cases[15]	
8.	Meconium Aspiration-10.8%	Banerjee et al [6]	

Table 2

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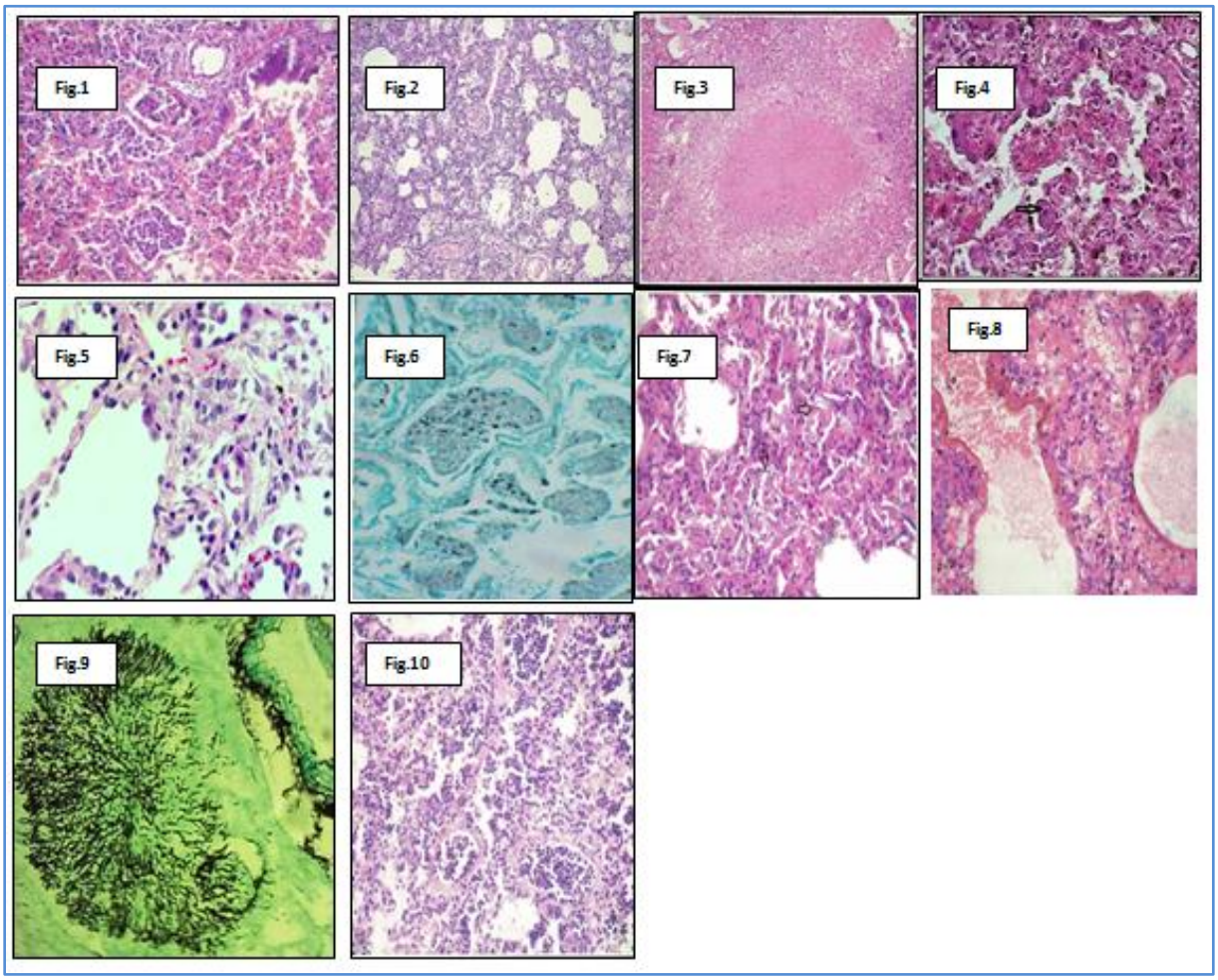

Figure 1: Bronchopneumonia with inflammatory exudate within the bronchus and surrounding alveoli.
Figure 2: Marked interstitial widening with dense lymphoplasmacytic infiltrate.
Figure 3: Tuberculous granuloma with central caseation surrounded by epitheloid cells and Langhans giant cells.
Figure 4: CMV induced intranuclear inclusions and denuded epithelium.
Figure 5: Smudged nuclei and desquamation in adenovirus pneumonia.
Figure 6: GMS showing trophozoits of P.carini.
Figure 7: Alveoli showing anucleate squammes in amniotic aspiration
Figure 8: ARDS with characteristic hyaline membrane lining the ecctatic alveolar spaces and intraalevolar hemorrhage. Figure 9: GMS stain showing Aspergillus.
Figure 10: Leukemic infiltrate in interstitium and blood vessels.

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