Spectrum of Pathology in Neonatal Deaths: An Autopsy Study

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ABSTRACT

BACKGROUND: The neonatal period (<28 days) is most vulnerable for child survival. Globally among all the deaths under five years in 2018, 47% are neonatal deaths. Most of these deaths are due to preventable and treatable causes like infections and intra-partum injury. It is important to understand underlying causes of neonatal death. The role of autopsy is very crucial in establishing the facts about death which helps to plan national and global health strategies.

AIMS: To evaluate the spectrum of neonatal pathology, estimate frequency of neonatal pathology and to address the most common neonatal pathology.

MATERIAL AND METHODS: A retrospective observational study of neonatal medicolegal autopsy cases received from January 2022 to December 2022 in autopsy section at Tertiary health care centre, Pune. Gross and microscopic examination was done. All the results were tabulated and analysed.

RESULTS: 93 cases were studied, out of which 73 early neonates (<= 7 days), 20 late neonates (>7 days), M:F = 1.06:1. The most common cause of death was lung pathology 96.7% cases, pulmonary haemorrhage (24.44%) and meconium aspiration (24.44%) were predominant lesion, pulmonary oedema (17.77%) and pneumonia (15.55%). Central nervous system (CNS) manifestations 10.75% and Liver Pathology 6.45%. Rare pathologies include Congenital Heart Disease (1.07%) and Renal pathology (1.07%).

CONCLUSIONS: It is vital to study the spectrum of histopathological features in neonatal deaths as it provides adequate diagnosis which helps to plan appropriate resource and management strategies in tertiary health care centre.

KEYWORDS: Neonates; Lung pathology; Haemorrhage.

INTRODUCTION

The neonatal period that is first 28 days of life is most vulnerable time for child survival.[1] Globally among all the deaths under five years in 2018, 47% are neonatal deaths.[2-3] India accounted for largest number of under 5

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years deaths around 0.9 million in 2018 and 55% of these were neonatal deaths. Government of India adopted a target of less than 10 neonatal deaths per 1000 live birth by 2030 to achieve global Sustainable Development Goal (SDG) target as a part of India newborn action plan (INAP).[4] Most of these deaths are due to preventable and treatable causes like infections and intra-partum injury.[5,6] It is important to understand trends in neonatal mortality and underlying causes of neonatal death. The role of autopsy is very crucial in establishing the facts about death which helps to plan national and global health strategies.[7-8] The purpose of this study is to evaluate the spectrum of neonatal pathology, estimate frequency of various neonatal pathology and to address

the most common neonatal pathology.

MATERIALS AND METHODS

We carried out a retrospective observational study at tertiary health care centre from January 2022 to December 2022. A total number of 93 neonatal medicolegal autopsy cases received in autopsy section were included in this study. Gross examination was done and histopathological examination done on H & E stain by two pathologists and reviewed. All the results were tabulated and analysed.

RESULTS

Total 93 cases were studied, out of which 73 were early neonates (<= 7 days) and 20 were late neonates (>7 days). Male deaths exceed female deaths with Male to Female ratio was 1.06:1.

The most common cause of death was seen in lung in 96.7% cases of which pulmonary haemorrhage

Table 1: Age and Sex wise distribution of cases

	Early	Neonate Late	Neonate	Total
Male		38	10	48
Female		35	10	45
Total		73	20	93

and meconium aspiration were predominant lesion in 24.44% cases followed by pulmonary oedema-17.77% and pneumonia-15.55%. CNS manifestations were seen in 10.75% (meningitis & subarachnoid haemorrhage) and Liver Pathology was seen in 6.45% cases. Congenital malformations were seen in 2.14% cases, which mainly involve Cardiovascular System (CVS) like Congenital Heart Disease (1.07%) and Renal system (1.07%).

Note: *Figures do not match as many cases had multiple organ involvement.*

Table 2: System wise distribution of Neonatal Pathology. (N=93)

No. of cases		Percentage
Pulmonary Pathology	90	96.7%
CNS Pathology	10	10.75%
Liver Pathology	06	6.45%
CVS Pathology	01	1.07%
Renal Pathology	01	1.07%
Other (Prematurity)	04	4.30%

In present study, delivery history is available in 30 cases, out of which 18 were home delivery and 12 were hospital delivery which indicates poor utilization of health facilities during antenatal and peripartum period. Extramedullary haematopoiesis present in 30 cases. Multiple organ involvements were seen in many cases.
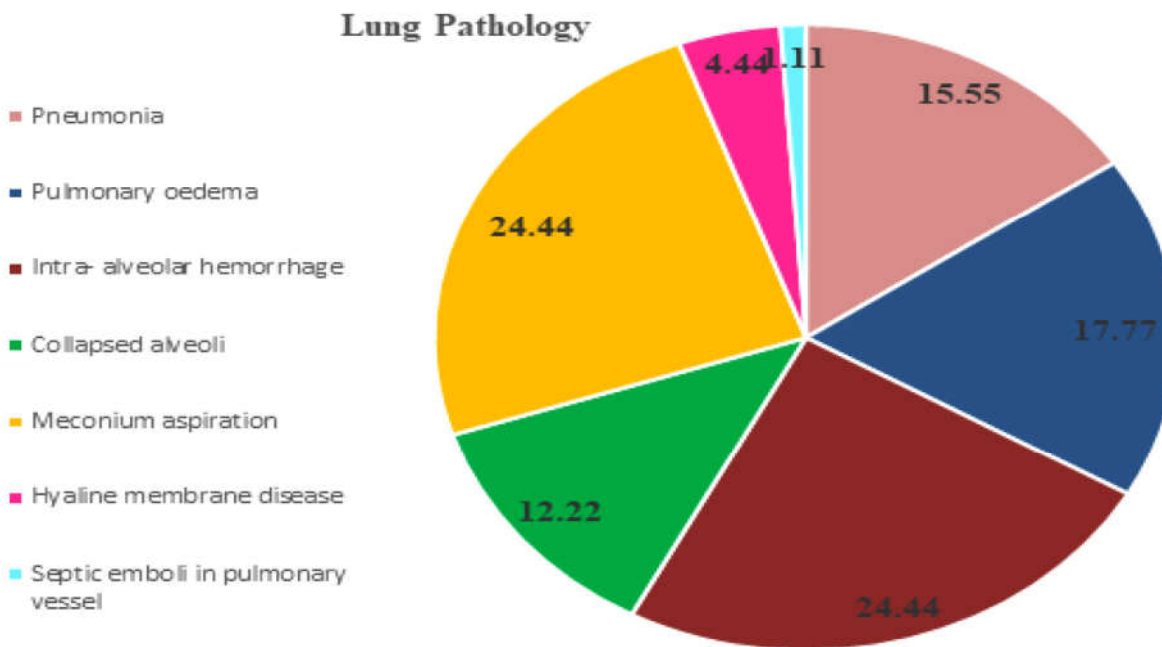

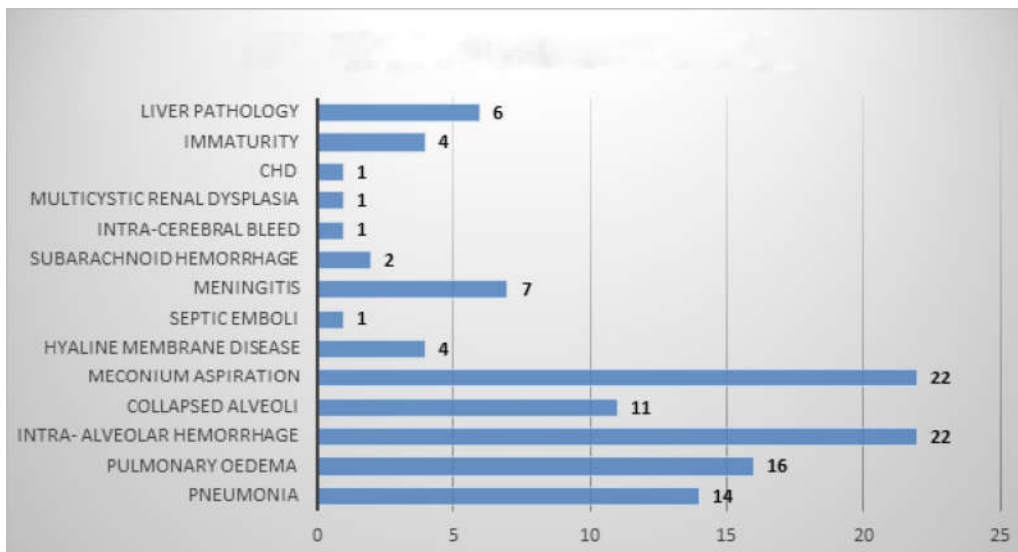**Fig. 1:** Spectrum of Pulmonary Pathology in (%)

Fig 2: Spectrum of Neonatal Pathology in (Numbers)

DISCUSSION

The Neonatal period that is <28 days of life is most critical for survival. Neonate carries highest risk of death, most of these deaths are due to infections and intrapartum injury which can be prevented with early identification and timely appropriate interventions. It is important to understand underlying causes of neonatal death and autopsy plays a valuable role in establishing the facts about death which helps to plan national and global health strategies.

In present study early neonatal deaths were seen in approximately 80% cases, majority of these deaths occurred in first 48 hours after delivery. This finding correlates with WHO report[9] that newborns face highest risk of death during neonatal period and many of these deaths occur in first week of life. These findings suggest that focussing on antenatal care and postnatal care immediately following birth is crucial for saving more newborn lives. This study found that neonatal deaths were more common in male than females. Male accounted for 52% of neonatal deaths which correlates with study done by Kurdukar M.D *et al*[10] and similar findings also documented in some other studies, stating biological difference might be possible factor for this gender variation in neonatal deaths.[11]

In this study, pulmonary pathology was the commonest autopsy finding in neonatal deaths. These pulmonary lesions varied with intra-alveolar haemorrhage (IAH) and Meconium aspiration being the commonest lesion each found in 24.44% cases. This finding correlates with study done by Grace D'costa *et al*.[8] IAH ranged from

focal to diffuse lesion. Pulmonary oedema (17.77%) and pneumonia (15.55%) were the second most common findings observed in present study, which is comparable with the study done by Odejimi *et al*.[5] Most of these pulmonary lesions occur as a manifestation of obstetric complications. This highlights the need to strengthen the obstetric care. Scrupulous perinatal care will help in reducing neonatal deaths due to these causes.

CNS pathology was found in 10.75% cases of which meningitis was predominant lesion seen in 7% cases, majority of them were bacterial meningitis. This finding correlates with study done by Odejimi *et al*[5] and Kurdukar M.D *et al*.[10] Acute bacterial meningitis may lead to sudden unexpected death particularly in neonates following exposure to pathogen in birth canal or amniotic fluid. Prematurity, prolonged rupture of membranes and very low birth weight are risk factors for neonatal meningitis. Early diagnosis and timely management with appropriate antibiotic therapy help to improve clinical outcomes of neonatal meningitis. Two cases of subarachnoid haemorrhage and one case of intracerebral bleed were seen.

Liver pathology was found in 6.45% cases which includes 5 cases of fatty change and 1 case of hepatocyte necrosis. Fatty change commonly seen incidentally at autopsy and it may occur secondary to sepsis, on exposure to drugs or following total parenteral nutrition.[12] Hepatocyte necrosis may be confused with autolysis. However, in hepatocyte necrosis there is patchy loss whereas diffuse loss often seen in autolyzed tissue. Extramedullary haematopoiesis (EMH) was present in 30 cases. EMH is a common incidental finding in the liver of neonates and is often seen with increased physiologic stress.[13]

This study found congenital malformations in the newborns in 2.14% of the cases which correlates with the study done by Chaturvedi P.[14] The incidence of congenital malformations reported in other studies from different parts of India is varies from 0.3% to 3.6%.[15-16] The systems involved in congenital malformations in present study were Cardiovascular system (CVS) and Renal system with congenital heart disease (1.07%) and Multicystic Renal dysplasia (1.07%) seen respectively. The neonatal autopsy plays vital role in identification and confirmation of congenital malformations and provide valuable information to clinician which help them for genetic counselling of the parents and to prevent these malformations in successive pregnancies.

In present study, delivery history is available in 30 cases, where majority of women were delivered at home which indicates poor utilization of health facilities during antenatal and peripartum period. This highlights the need to educate pregnant females to access the specialized care for the newborn as required.

Overall, neonatal infections (pneumonia/meningitis) and intrapartum injury were the leading causes of neonatal deaths. Similar findings were reported in other studies.[17-18] This highlights need to promote antenatal care services (ANC) and postnatal care services (PNC) as a strategy to reduce neonatal deaths.

This study had certain limitations as there was lack of adequate clinical details, it was difficult to find out the concordance between antemortem and post-mortem diagnosis. Hence the police authorities and ancillary health care workers should also be trained for verbal autopsy.[18]

CONCLUSION

Despite of the recent advances in clinical care and imaging studies, it is vital to study the spectrum of histopathological features in neonatal deaths as it provides adequate diagnosis which helps to plan appropriate resources and management strategies in tertiary health care centre.

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