

# Study of spectrum of multiorgan dysfunction in neonates with perinatal asphyxia in rims SNCU

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## Abstract

**Background:** Perinatal asphyxia is one of the main cause, which leads to prolonged hospitalization due to multiple organ dysfunction and sometimes resulting of death. In the developing countries 23% of neonatal deaths are due to birth asphyxia. Multi organ failure and HIE are the most dangerous complications among the complications of birth asphyxia. Very few research has been done about the association between the traditional perinatal markers of asphyxia and multiple organ involvement in developing countries. **Aims and Objectives:** To study the clinical profile, the frequency of different organ system involvement on early neonatal morbidity and mortality in asphyxiated neonates and to assess the patterns of involvement of each major organ/system in term asphyxiated neonates. **Material and Methods:** This is a prospective study carried out on 100 asphyxiated term neonates who were admitted on their first day of life to the neonatal intensive care unit (NICU) of a tertiary care hospital rims over a period of two years from September 2017 to September 2019. **Results:** Central nervous system involved 54% study subjects, respiratory system involved in 42% while cardiovascular system in 20%, GIT in 21% and haematological system involved in 14% study subjects, as in the few cases multiple systems involved in the same study subjects. **Conclusion:** Early recognition of the infants at greatest risk of multisystem dysfunction after a perinatal asphyxia insult may affect the management of these infants.

**Keywords:** Perinatal asphyxia, Multi organ failure, Neonates.

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## INTRODUCTION

Perinatal asphyxia is one of the main cause, which leads to prolonged hospitalization due to multiple organ dysfunction and frequently these complications result in death. Among the survivors there might be brain damage which results in developmental delay and spasticity. It is an important cause of neonatal mortality, morbidity and late sequelae in developing countries like India.<sup>1,2</sup> Perinatal asphyxia can be described as a condition with impaired gas exchange which leads to fetal

hypoxemia and hypercarbia during the first and second stage of labor. In the perinatal asphyxia dysfunction of organs other than the central nervous system is a common clinical feature. Perinatal asphyxia followed by multi organ dysfunction (MOD) is due to asphyxia induced diving reflex which leads to shunting of blood from non-vital organs like skin to vital organs like heart, adrenals and brain to protect these organs from hypoxic-ischemic (HI) injury.<sup>3,4</sup> This condition is harmful to the newborn due to a lack of oxygen and/ or a lack of perfusion to various organs. It is usually associated with tissue lactic acidosis and hypercarbia when accompanied by hypoventilation. The American Academy of pediatrics has defined perinatal asphyxia as cord umbilical artery pH <7.0 with a base deficit >10 meq/litre, neurologic manifestations suggestive of hypoxic ischemic encephalopathy and multi organ system dysfunction.<sup>5,6</sup> Every year about 4 million neonates die worldwide, representing 38 % of all deaths of children under 5 years of age. In the developing countries 23% of neonatal deaths are due to birth asphyxia. Multi organ failure and HIE are the most dangerous complications among the

complications of birth asphyxia.<sup>1</sup> However very few research has been done about the association between the traditional perinatal markers of asphyxia and multiple organ involvement. Early recognition of the infants at greatest risk of multisystem dysfunction after a perinatal asphyxia insult may affect the management of these infants.

### AIMS AND OBJECTIVES

1. To study the clinical profile, the frequency of different organ system involvement on early neonatal morbidity and mortality in asphyxiated neonates.
2. To assess the patterns of involvement of each major organ/system in term asphyxiated neonates.

### MATERIAL AND METHODS

This is a prospective study carried out on 100 asphyxiated term neonates who were admitted on their first day of life to the neonatal intensive care unit (NICU) of a tertiary care hospital over a period of one year from May 2018 to May 2019.

#### Inclusion criteria:

Babies admitted in the hospital with evidence of asphyxia indicated by any three of the following:

- (i) APGAR  $\leq$  3 at 5 minutes.<sup>9</sup>
- (ii) fetal heart rate  $<$  60/min
- (iii) Meconium stained amniotic fluid
- (iv) need for positive pressure ventilation for  $>$ 1 min

#### Exclusion criteria:

- (i) Preterm babies
- (ii) Neonates with congenital malformation,
- (iii) Neonates mothers who would have received magnesium sulphate injection within 4 hours prior to delivery or received opioids (pharmacological depression) or any other form of sedation.
- (iv) Baby born outside RIMS hospital.

#### Collection of data:

- Detailed birth history including all major events, resuscitation details, other neonatal and maternal data were recorded.
- Gestational age was assessed by last menstrual period and new Ballard score.
- All babies were thoroughly examined at the time of admission and each baby was followed up till discharge with special emphasis on the affected organ system.
- Basic investigations for evaluation of MOD were done as per NICU protocol.

#### Criteria for organ dysfunction:

- Central nervous system involvement: Detailed neurological examination was done and features of CNS involvement like seizures, abnormal tone and altered sensorium were noted. Clinical classification of

neurological status for HIE staging was done by modified Sarnat and Sarnat's staging. Ultrasonography (USG) of brain was done within 48 hours of admission. Magnetic Resonance Imaging (MRI) of brain and electroencephalogram (EEG) were done before discharge for babies who were HIE stage II or more.

- Renal involvement: Anuria or oliguria (urine output  $<$  1 ml/kg/hr) persisting for 24 hours or more after a volume challenge test [20 ml/kg of normal saline (NS) bolus] and diuretic challenge [Furosemide (4 mg/kg)], and/or blood urea  $>$  40 mg/dl, and/or serum creatinine  $>$  1 mg/dl, and/or rise in serum creatinine  $>$  0.3 mg/dl.
- Cardiovascular system involvement: Hypotension (mean BP  $<$  40 mm Hg) treated with inotropes and/or serum CPK-MB more than 25 IU/l.
- Hepatic involvement: Serum SGPT more than 60 IU/l at 24 hours of life.
- Gastro-intestinal tract: RT aspirates more than 30 % of total intake in last 6 hours.
- Hematological involvement: NRBC count of more than 10 per 100 WBC.

Data were tabulated and analyzed with the help of SPSS 10.1 software. Percentage of involvement of individual organs was calculated.

### RESULT

Data collected, tabulated and statistically analyzed with SPSS software.

**Table 1:** Showing the basic perinatal characteristics of all the babies

Perinatal Characteristics	Total study subjects(n=100)
Gender	
Male	43
Female	57
Maternal Age	
18-20	17
21-25	25
26-30	34
31-35	24
Parity of mother	
Primipara	45
Multipara	55
Mode of delivery	
NVD	43
LSCS	57
Muconium stained liquor	
Present	16
Absent	84
Ventilator requirement	
Ventilated	49
Non ventilated	51
Outcome	
Survived	88
Death	12

**Table 2: Showing pattern of organ involvement.**

Organ/System Involved	Number	Percentage (%)
CNS	54	54%
RS	42	42%
CVS	20	20%
GIT	21	21%
Haematological	14	14%

## DISCUSSION

In the presents study we observed and analyzed 100 study subjects for multiorgan dysfunction in asphyxiated neonates. Out of 100 study subjects 43 were male and 57 were female neonates. We observed maternal age out of which there were 17 females from 18 to 20 years of age group, 25 were from 21 to 25 years age group, 34 from 26 to 30 years age group, 24 from 31 to 35 years age group, out of these 45 were primipara and 55 were multipara. Out of 100 study subjects normal vaginal delivery occurred in 47 while LSCS done in 53 cases. Muconium stained liquor was present in 14 cases. There were 49 study subjects required ventilatory assistance and 88 patients survived and cured. (Table 01) Table 02 explained the pattern of system involvement. Central nervous system involved 54% study subjects, respiratory system involved in 42% while cardiovascular system in 20%, GIT in 21% and haematological system involved in 14% study subjects, as in the few cases multiple systems involved in the same study subjects. In the similar study done by Khangembam S. Singh *et al*<sup>1</sup> they observed that multiple organ dysfunction occurred in 63.1% infants and 27.6% died during the study; Central Nervous System (CNS) was most frequently involved (69.4%). Involvement of CNS in 42 infants i.e. 22.1%) most of the time occurred with involvement of other organs, although moderate CNS involvement was isolated in 90 infants. Gastrointestinal organ involvement occurred in 52.1%, respiratory system in 44.2%, cardiac in 48.4% infants. Shah P *et al*<sup>7</sup> in their study stated that Out of 130 infants with outcome data, 80 (62%) had severe adverse outcome and 50 (38%) had good outcome. All infants had evidence of MOD i.e. at least one organ dysfunction in addition to HIE. Cardiovascular, Renal, respiratory system and gasterointestinal dysfunction was present in 64–86% of infants with adverse outcome and 58–88% of infants with good outcome. Satish Chandra P *et al*<sup>6</sup> in their research found that of 102 babies, 59 were males and 43 were females. Central nervous system (CNS) involvement occurred in all 102 (100%) neonates.

Hypoxic ischemic encephalopathy was the most common presentation of CNS involvement. Respiratory involvement was noted in 42 (41.5%). Renal involvement was seen in 27 (26.5%). Cardiovascular system involvement was observed in 26 (25.5%). Gastrointestinal involvement was observed in 16 (15.68%). Hematological abnormalities were seen in 14.7%. Also the study done by Ana Martin-Ancel *et al*<sup>8</sup>, they observed that Involvement of one or more organs occurred in 82% of the infants; the central nervous system (CNS) was most frequently involved (72%). Involvement of CNS (7 infants) frequently associated with involvement of other organs, although moderate CNS involvement was found in 14 infants. Gastrointestinal organ involvement occurred in 42%, involvement of respiratory system in 26%, cardiac in 29% of the infants.

## CONCLUSION

Present study highlighted the varied clinical picture of multisystem involvement in asphyxiated newborn infant and explaining the need for global management of these infants. There is a tremendous need to study this clinical entity with a larger sample size and for a longer duration at more centers in India to give some new dimensions and guidelines for practicing pediatricians.

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