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Pediatrics

STUDY ON PERINATAL ASPHYXIA ON CHILDRENADMITTED IN OUR PEDIATRIC INTENSIVE CARE UNIT

Muralidhar Reddy.K	Assistant professor in Department of Pediatrics, Narayana Medical College, Nellore, India.
Anil Kumar.P	Associate professor in Department of Pediatrics, Narayana Medical College, Nellore, India.
Chandra Mohan.P	Assistant professor in Department of Pediatrics, Siddhartha Medical College, Vijayawada, India.
Sreenivasachowdary. J*	Senior Resident in Department of Radiology, Govt General Hospital, Eluru, India *Corresponding Author

ABSTRACT

Objectives: Perinatal asphyxia is one of the most common causes of neonatal mortality and morbidity in India. To know the outcome of asphyxia sophisticated devices like EEG, CT and MRI, are needed which are unlikely to be available in many parts of our country. The illness can be explained based on the evaluation of biochemical markers and many studies have been done so far reporting varied results. This study is to ascertain the extent of biochemical abnormalities in correlation to clinical presentation and the significance of the biochemical markers in explaining the outcome of the asphyxia.

Methods: The study includes 100 asphyxiated newborns, consecutively admitted in Neonatal Intensive Care Unit, Narayana Medical College Hospital, Nellore, during the period of November **2016** to November **2017**. Out of 100 asphyxiated newborns, 62 were delivered at Narayana Medical College Hospital, Nellore and 38 were delivered outside the institute and brought within 6 hours of life to the Narayana Medical College Hospital, Nellore. Perinatal asphyxia has been considered based on the umbilical arterial pH, APGAR and need for resuscitative efforts at the time of birth. The babies were categorized into two groups with the prescribed criteria as Group A (n=48), and Group B (n=52)groups, respectively. Data was analyzed using Z test and Chi square test. ROC curves have been laid in explaining the best biochemical marker.

Results: The mean gestational age among Group A and Group B are 37.6weeks ±3.8and 37.4weeks ±7.16 respectively. The biochemical markers taken into thestudy are Serum electrolytes sodium, potassium, calcium which were performed on day 1of life; Liver enzymes, lactate dehydrogenase (LDH), alanine aminotransferase (ALT) and aspartate aminotransferase (AST) and Renal function tests — Blood urea and Serum Creatinine which were done on day 3 of life. The clinical presentation was correlated clinically with the biochemical abnormalities. The study has shown that the duration of hospital stay is directly proportional to the severity of the abnormalbiochemical markers. Group A babies have got more antenatal, and natal risk factors, in a statistically significant manner, when compared with Group B. All the newborns of Group A landed in HTE II / III, whereas only 20 (38.5%)newborns of group B landed in HIE II/III. Blood urea, serum creatinine and Serum LDH values were showing significantstatisticaldifferencesbetween two groups. Out of these biochemical markers Serum LDH appears to be more sensitive and specific in explaining the severity of asphyxia.

Conclusion: Biochemical markers help a lot in explaining the severity and outcome of the asphyxiated illness, especially where sophisticated devices are not available. Among the markers, Serum Lactate dehydrogenase is the most accurate in explaining the outcome.

KEYWORDS : Perinatal asphyxia, clinical correlative study, biochemical markers - Serum lactate dehydrogenase (LDH), alanine aminotransferase (ALT) and aspartate aminotransferase (AST), Blood urea and Serum Creatinine.

INTRODUCTION

Neonatal mortality accounts for around 70% of infant deaths in India. Very early neonatal period mortality, deaths occurring in < 24 hours of life, is major concern among neonatal mortality. Perinatal asphyxia is one of the most common causes of neonatal mortality and morbidity in India. Accurate estimates of the proportion of neonatal mortality attributable to birth asphyxia are limited by the lack of a consistent definition for use in community based settings and the absence of vital registration in communities where the majority of neonatal deaths occur. Perinatal asphyxia significantly leads to multiorgan dysfunction. The insult results in releasing a lot number of intracellular enzymes which are helpful in explaining the outcome of the illness. The confirmation ofseverity of asphyxia and to explain the prognosis requires very sophisticated tools like EEG, CT, MRI, which are unlikely to be available in the most parts of our country. The signs of birth asphyxia are nonspecific and overlap with other illnesses like metabolic disturbances i.e hypoglycemia, hypocalcaemia & early onset sepsis. In the absence of perinatal records, it is difficult to retrospectively diagnose perinatal asphyxia in a term infant with perinatal asphyxia renal, neurologic, cardiac and lung dysfunction occurs in 50%, 28%, 25% and 23% cases respectively.

The extent of multi-organ dysfunction determines the early outcome of an asphyxiated neonate with either the neonate succumbing as a consequence of organ damage or recovering completely. Once the bay recovers completely, usually there will be no long termsequelae associated with these organ system derangements. The main line of treatment in perinatal asphyxia is supportive care, though the insult affects multiple organ systems.

The early detection of severity of the insult helps in the ameliorating the neonatal mortality and morbidity. The present study is to ascertain the significance of the biochemical markers in exp1aining the outcome of the illness and thereby promoting the appropriate management and finally reducing the neonatal mortality and morbidity.

AIMS AND OBJECTIVES

1. To correlate clinical and biochemical profile in asphyxiated babies.
2. To study biochemical abnormalities in asphyxiated newborns and their relevance in assessing the severity of asphyxia.

RESULTS

Male and female distribution among Inborn and Outborn are depicted below

Table 1: Gender distribution

S.NO	Total 100		
	Sex	Inborn 62	Outborn 38
1	Males	36 (58.06 %)	19(50 %)
2	Females	26(41.94 %)	19(50 %)

Further they are divided in to two groups according to gender

Group A comprise 48 babies, of which 27 are males and 21 are females.

Group B comprises 52 babies of which 28 aremales and 24 are females.

The mean gestational age of the babies seen among Group A is 37.8 ±4.2 weekswith preterms being 30 (62.5 %) and post terms are 15 (31.25%). The mean gestational age among Group B is 37.15 ±5.89 weeks, with preterms being 23 (44.2 %) and post term 8(15.4%). The mean birth weight among Group A and Group B are 1.89 kg ±3.2 and 2.01 kg ±4.1 respectively.

Various risk factors related to asphyxia have been encountered while doing the study, like gestational age, primies. mothers with lack of antenatal care, history of pregnancy induced hypertension, mothers who have been sustained to prolonged second stage of labour, prolonged rupture of membranes, mode of delivery by instrumental or emergency caesarian section. babies born with thick meconium stained amniotic fluid. Allthe risk factors were found to be higher in Group A when compared to Group B, but the statistical significant difference was found to be present only in primies, mothers with lack of antenatal care and babies with thick meconium stained cord.

Table:2 Risk factors – Statistical differences among groups

Variable	Group A(n=48)	Group B(n-52)	Z Score P Value	Statistical significance
Preterm	30(62.5%)	23(44.23%)	1.34(>0.05)	Insignificant
Post term	15(31.25%)	8(15.4%)	1.53(>0.05)	Insignificant
Primie	30(62.5%)	22(42.3%)	4.07(>0.05)	Significant
Lack of antenatal care	32(66.7%)	23(44.23%)	5.07(>0.05)	Significant
Prolonged second stage of labour	29(60.41%)	22(42.3%)	1.27(>0.05)	Insignificant
Prolonged rupture of membranes	26(54.2%)	20(38.5%)	1.48(>0.05)	Insignificant
Instrumental Delivery	18(37.5%)	13(25%)	1.22(>0.05)	Insignificant
Emergency C/S	28(58.3%)	28(53.8%)	0.2(>0.05)	Insignificant
PIH	28(58.3%)	24(46.1%)	1.28(>0.05)	Insignificant
Thick meconium stained cord	31(64.6%)	23(44.2%)	4.16(>0.05)	Significant

Table 3.HIE II & III - Statistical difference among groups

	Group A(n=48)	Group B(n=52)
HIE Stage II & III	48(100%)	20(38.5%)

Among the variables under study, serum sodium and calcium were found to be lower among the Group A compared to Group B. but not in a statistically significant manner. Serum potassium is high in Group A, but there is no statistical significant difference between the two groups. Liver enzymes — SGOT and SGPT are elevated in Group A compared to Group B, but there does not exist any statistically significant difference between the two groups. Serum lactate dehydrogenase levels are found to be very much elevated, in a statistically significant manner, among Group A when compared to Group B. Blood urea and Serum creatinine are elevated in Group A compared to Group B in a statistically significant manner. Thus serum LDH levels, blood urea and serum creatinine have shown statistically significant difference between the two groups.

Table.4. Biochemical Variables - Statistical difference among groups

Variable	Group A (n=48)	Group B (n-52)	Z Score P Value	Statistical significance
Serum Sodium (mmol/L)	128.27 ± 12.1	132.11 ±11.1	1.33(>0.05)	Insignificant
Serum Potassium (mmol/L)	5.7 ±1.22	5.49 ±1.3	0.84(>0.05)	Insignificant
Serum Calcium (mg/dl)	6.9 ± 1	7.2 ± 2.6	0.69(>0.05)	Insignificant
SGOT (U/L)	143.25 ±16.1	137.5 ±18.7	1.53(>0.05)	Insignificant
SGPT (U/L)	54.92 ±15.31	49.57 ±17.78	1.49(>0.05)	Insignificant
LDH(U/L)	1210.7 ±138.72	425.76 ±76.19	34.32(<0.01)	Significant
Blood Urea (mmol/L)	43 ±22.2	22.7 ±7.76	5.9(<0.01)	Significant
Serum Creatinine (mg/dl)	2.13 ±1.38	0.79 ±0.4	6.7(<0.01)	Significant

DISCUSSION

Sex distribution: Our study has shown asphyxia is more common among the males and even the severity is more common among males.

Risk factors: All the risk factors were found to be higher in Group A when compared to Group B, but the statistical significant difference was found to be present only in primies, mothers with lack of antenatal care and babies with thick meconium stained cord.

All the Group A babies have landed in HIE II/II, whereas 20 (38.5%) newborns of Group B have landed in HIE II/II. The biochemical parameters, serum sodium, and calcium are lower in Group A and Group B, but there is no statistical difference.

SGOT, SGPT are increased in severely asphyxiated children inferring the extent of hepatic injury, but no statistical difference was found among the two groups.

Blood urea and serum creatinine are very much higher in Group A than Group B in a statistically significant manner. Among the variables serum LDH appears to be strongly elevated than the other variables in Group A.The study has shown that the severity of asphyxia is proportional to the variation of the biochemical markers. Among the markers serum LDH is the most accurate in explaining the severity with sensitivity of 100% and specificity of 88.5%with area under ROC curve of 1. The previous studies had taken many biochemical variables in explaining the severity of asphyxia. The results of these studies have shown varying significance of the variables.

Sanath Reddy, *et* al. found that raised LDH had100% sensitivity, while CK-M13 had 100% specificity for asphyxia. They concluded that LDI I at 72 hr of life is the most accurate at differentiating asphyxiated from non-asphyxiated symptomatic neonates and that LDH could be used at 3 days of age to diagnose asphyxia retrospectively (1).

Sanchez-Nava, *et al.*showed that SGOT, SGPT and LDH were raised among asphyxiated babies(2).

Lackmann,*etal*. found that newborn infants with asphyxia have significantly higher values of SGOT (AST), LDH and hydroxybutyrate compared to neonates with only RDS, and presence of RDS among asphyxiated neonates did not alter the enzyme levels(3)

Mathias Karlsson had shown that a cut off level of 1049 U/L for LDH was the most suitable predictor of mild, moderate, and severe HIE with a sensitivity of 100% and specificity of 97% (4).

Karlsson Mathias *et al,* in their study at Sweden, found that in 12 of the 26(46.1%) asphyxiated infants, serum alanine aminotransferase (S-ALAT) pattern compatible with hypoxic hepatitis was found. Similar patterns were seen in serum aspartate aminotransferase (S-ASAT). S-ALAT and AAT concentrations 0-72 h after birth correlated significantly with severity of hypoxic-ischemic encephalopathy (5).

Esque Ruiz *et al*, in their study at Spain, found that the newborn infants with HIE presented higher levels of transaminases, especially of AST (p= 0.000001). No relation *was* found between values of blood ammonia and transaminases(6).

BasuP *et al*, have shown that hyponatremia and hypocalcaemia developed early and simultaneously and the decrease in their serum levels was directly proportional to each other and to the degree of asphyxia (7).

CONCLUSION

Following observations are made in the study

I. Male newborns have a higher incidence of birth asphyxia and the severity of asphyxia is more common among males.
2. Majority of neonates have risk factors associated with birth asphyxia: the risk factors like lack of antenatal care, primes and

thick meconium stained cord are found to be associated with increased severity.

3. Many biochemical variables are found to be proportionately worsened with the severity of the illness. Our study has shown the statistical significance among Blood urea, Serum creatinine and LDH levels. Among the three, Serum LDH is found to be associated with the highest sensitivity and specificity in assessing the severity of asphyxia.

The present study concludes that biochemical parameters are very much useful in explaining the severity of illness, especially in areas where sophisticated devices are not available. This is very helpful, especially in cases of extramural newborns with improper records, to explain the severity of the asphyxia.

The biochemical variables that help in explaining the severity are blood urea, serum creatinine and serum LDH levels. Among the variables, serum LDH on day 3 of life has got most specificity and sensitivity in explaining the severity of asphyxia.

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