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Maternal Characteristics and Multiorgan Dysfunction (MOD) Among Babies with Hypoxic Ischemic Encephalopathy

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ABSTRACT

Background: Perinatal asphyxia and Hypoxic ischemic encephalopathy are an important cause of mortality and morbidity in neonates in India. Odisha is one of the states with highest neonatal mortality rate. Multiorgan dysfunction is common occurrence in HIE and proportionately related to severity of HIE. Their correlation can be used as a predictor of outcome. Objective: Present research was undertaken to study correlation of maternal factors and severity of different organ systems involved in HIE with outcome.**Materials and Methods:** Above study was a prospective, hospital-based study. Carried out in SNCU of MKCG Medical college & hospital. All newborns requiring resuscitation with PPV or APGAR Score of less than 7 at 5 minutes or beyond were included. Various organs involved in HIE were studied. p value less than 0.05 was considered significant.**Results:** A total of 320 babies were included. Most of the mothers (n=217) were primi and mean age at delivery was was 22±1.6 year. Majority (75.8%) babies were born vaginally. HIE II and HIE III stage babies were showing multiorgan dysfunction. Renal, Cardiac, GI and Hepatic involvement was statistically significant.**Conclusion:** Preventing HIE in utero is essential. Focused approach by proper Antepartum & Intrapartum interventions is required. Multiorgan dysfunction is common in HIE babies hence emphasize need of global management of HIE babies for better outcome.

Keywords: Perinatal asphyxia, maternal factors, multiorgan involvement.

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INTRODUCTION

Perinatal asphyxia and hypoxic ischemic encephalopathy (HIE) are an important cause of mortality and morbidity in the neonates in India. The occurrence is higher in developing countries and especially in Indian states with low socio-demographic index (SDI) levels. The national average of neonatal mortality rate (NMR) is 26/1000 live births. The states with highest NMR include Odisha, Uttar Pradesh and Rajasthan.[1-3] There is occurrence of multiorgan dysfunction (MOD) among babies with perinatal asphyxia and HIE. The severity of MOD increases with the severity of HIE and there is a variation in the organs affected. Damage in organs affected by HIE may be used as potential predictors of outcome in such cases.[4] The present study was thus undertaken to study the correlation of maternal factors and severity of different organ systems in HIE with outcome in the Southern Odisha.

MATERIALS & METHODS

This was a prospective Hospital based study conducted in Special Newborn Care Unit (SNCU), Department of Pediatrics, M. K. C. G. Medical College and Hospital, Berhampur after getting permission from Institutional ethical committee during the period October 2016-September 2017. All the newborn requiring resuscitation with positive pressure ventilation (PPV) or an APGAR score <7 at or beyond 5 minutes of life were included. Those babies born < 35 weeks or with gross congenital anomalies were excluded from the study. During the study period, 320 babies met the above criteria and were enrolled after obtaining written informed consent from the parents. A detailed history about the sociodemographic characteristics along with obstetric history of mother was taken. The clinical details including weight, vitals, systemic findings, HIE staging (Sarnat and Sarnat), laboratory parameters (complete blood count, liver function tests, serum electrolytes, serum urea, creatinine, sepsis screen when appropriate), need of inotropic support, and outcome were entered in the structured Performa. (5)

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RESULTS

The mean age of mother at delivery was 22 + 1.6 years and most of them were primi (n=217). Fifty eight percent (n=185) of these belonged to lower socioeconomic strata. The majority of these babies (75.8%) were born vaginally. The clinical and sociological factors of mother were compared with outcome (discharge or death) as depicted in the table 1.

Table 1: Comparison of clinical and social profile of mothers with outcome

Parameter		Frequency n=320 (%)	Discharge n= 196 (%)	Death n=124 (%)	p-value
Place of delivery	Inborn	103 (32)	65 (63)	38 (37)	0.081
	Outborn	217 (68)	131 (60)	86 (63)	
Parity	Primi	217 (68)	126 (58)	91 (42)	<0.0001
	Multi	103 (32)	70 (68)	33 (32)	
Maternal obstetric profile					
Eclampsia		14 (4.3)	8 (58)	6 (42)	0.74
Prolonged labor		62 (19)	40 (65)	22 (35)	0.55
Obstructed labor		26 (8)	13 (50)	13 (50)	0.21
Meconium-stained liquor		15 (4.6)	8 (53.4)	7 (46.6)	0.51
Breech		7 (2.8)	5 (71.5)	2 (28.5)	0.57

Out of those 320 babies, most of them were males and were weighing > 2.5 kg. The mean weight of the babies was 2.67 + 0.44 kg. All the babies were having convulsions, and poor response to stimuli. The frequency of various organs involved and its association with outcome is being depicted in [Table2 and 3]. The liver enzymes were considered elevated when SGOT or SGPT > 100 IU/L. The elevated creatinine was considered at levels > 1.1 mg/dl. Cardiac involvement was considered in babies requiring inotropes to maintain capillary refilling time (CRT) < 3 seconds. The occurrence of MODS in this study was 91 % and the occurrence of death increased with number of organ systems involved. We found that in addition to CNS, 35% of cases were with 3 other organ involvement followed by 26.87 % cases with 4 or more organs involvement.

Table 2: Clinical profile of babies and its association with outcome

Parameter		Frequency n= 320 (%)	Discharge n=196 (%)	Death n=124 (%)	p-value
HIE stage	II	250 (78)	171 (68.4)	79 (31.6)	<0.0001
	III	70 (21.8)	25 (36)	45 (64)	
Elevated liver enzymes		212 (66.3)	124 (59)	88 (41)	0.155
Elevated creatinine		198 (61.8)	87 (44)	111 (56)	<0.0001
Cardiac involvement		100 (31.2)	27 (27)	73 (73)	<0.0001
Recurrent apnea		128 (41)	51 (40)	79 (60)	<0.0001
GI bleed		109 (34)	49 (45)	60 (55)	<0.0001

(HIE: hypoxic ischemic encephalopathy)

Table 3: The number of additional organ systems (other than CNS) affected and outcome

Additional organs affected	Frequency n=320 (%)	Discharge n=196 (%)	Death n=124 (%)	p-value
1	45 (14)	39 (86.7)	6 (13.3)	<0.0001
2	66 (20.6)	54 (81.8)	12 (18.2)	
3	112 (35)	80 (71.4)	32 (28.6)	
> 4	86 (26.8)	12 (14)	74 (86)	

DISCUSSION

Hypoxic ischemic brain injury during the perinatal period remains the single major cause of neonatal mortality and chronic disability with sequel. Inspite of advances in the treatment, the outcome has not much changed. In the present study, the mortality was 38.7 % out of 320 neonates with moderate to severe HIE. The majority

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(58%) cases belonged to lower socioeconomic status and from rural areas. The mean age of mother was 22 + 1.6 years and most of them were primi (n=217; 68%), which is in concurrence with studies in developing countries due to the prevailing customs and social reasons. The males in the study were 64.3%.[6-9] The problem was more seen in term babies and with normal weight (n=239; 75%). These support the findings from the previous studies. The number of extramural babies was much higher similar to previous studies as our Hospital was a referral centre. But in few studies, the inborn outnumbered the outborn, that could be due to differences in bed allocation and availability and study design.[10] Most of the babies (85%) were born vaginally and points to the lack of facilities in the remote areas to treat effectively the cases of fetal distress. Hence, the most common risk factors identified was prolonged labor. The finding might be still higher than reported due to the missing partogram in most referred cases.[11]

As we included babies with moderate to severe HIE, brain was involved in all cases with manifestations of depressed sensorium and convulsions. The occurrence of multiple organ dysfunction was 91%. Next to brain, there was involvement of liver (66%), kidney (62%), respiratory (41%) and cardiac (31%) system. Similar to the findings in our study, P Shah et al found that hepatic and renal involvement was high (60% each) after brain. In that study, the respiratory involvement was much higher (86%).[12] In contrast to our results, there was 100% cardiac involvement in the study by Vemuri et al.[8] A much lower (35%) hepatic involvement was observed by Laila H Mohammed.[13] In almost all cases, renal involvement was seen in 60 to 70 % cases. The mortality was highest (73%) with involvement of cardiac system in our study. This was followed by respiratory involvement (60%) in babies. One study in past had similarly high rates of mortality with cardiac involvement.[8] In other studies, they found significant association of respiratory involvement with mortality.[12,13] There was DIC and GI bleed in some studies with 50 to 55% mortality.[9,13] Similar to the observations in our study, there was increased risk of mortality with increase in the number of organ systems involved. The death risk was significantly higher (86%) with involvement of > 3 organs compared to < 3 organs involvement (28%). Similar increase in death rate was observed in the previous studies.[12,13]

CONCLUSION

Prevention of HIE in utero by proper antepartum and intrapartum surveillance of all deliveries specially the high-risk groups is the need of the hour. Morbidity and mortality correlate directly with stages of HIE. Multiorgan dysfunction is a common finding and emphasize need of global management of asphyxiated babies. Our study had good sample size and babies were closely monitored throughout. Our study was limited by the lack of ABG analysis during inclusion and the lack of provision of adequate ventilator care due to the limited number of ventilator beds in our unit. We had limited data on the use of antibiotics during that period. We conclude that, in all babies with moderate to severe HIE, babies need to be closely monitored for organ dysfunction and intervene early with judicious use of fluid, inotropes, anticonvulsants and ventilation as required in the course of the disease.

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