

## Predictors of Perinatal Outcome in Full term Neonates with Hypoxic Ischemic Encephalopathy.

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### Summary:

**Background:** Hypoxic ischemic encephalopathy (HIE) means failure to establish effective spontaneous breathing after complete delivery & leads to many changes if not diagnosed or treated immediately as mental retardation, cerebral palsy and epilepsy.

**Objective:** to study the demographic and clinical predictors of perinatal outcome in full term neonates with hypoxic ischemic encephalopathy.

**Methods:** Forty two neonates were diagnosed as cases of hypoxic ischemic encephalopathy by specialist pediatricians & admitted in Children Welfare Teaching Hospital & Al Kut Hospital in the period from January 2008 to March 2009. Predictors studied were sex, birth weight, Apgar scores at 1,5,15 min., meconium aspiration, lethargy, muscle tone, convulsion. Outcome was also recorded. Statistical analysis was done by the use of fisher exact test.

**Results:** The total number studied were forty two neonate. Half of them were born at home & others in hospital with a male / female ratio= 1/1. Thirty three newborns had normal birth weight & nine had low birth weight. the mean apgar score recorded for sixteen neonate born in hospital at 1 minute =  $4.3 \pm 1.922$ , at 5minute= $6.06 \pm 2.08$  and at 15 minute =  $6.62 \pm 2.33$ . out of the 21 hospital born babies with HIE, 6 died and 15 improved and out of 21 home born babies with HIE 4 died and 17 improved. The difference was not statistically significant. P. value.0.7.

**Conclusion:** Full term newborn babies with HIE died more frequently if they were males, with low birth weight, with Apgar scores of < 4 at 1 min., 4-7 at 5 and 15 min., meconium aspiration, convulsion, hypotonic. Hypertonia and lethargy were noticed to be associated significantly with perinatal mortality in newborns with HIE.

**Keywords:** Predictors, HIE, Fullterm Neonates

*Fac Med Baghdad  
2011; Vol. 53, No. 2  
Received Nov. 2009  
Accepted Mar. 2010*

### Introduction:

Asphyxia literally means "no pulse," (1) which implies depression of heart action and collapse of the circulation. However, a broader definition of asphyxia includes respiratory dysfunction and impaired gas exchange. (2, 3) Both aspects of the condition lead to hypoxia, or reduced availability of Oxygen, anoxia or total lack of Oxygen, and hypercarbia, or inability to adequately eliminate carbon dioxide. (4, 5) Perinatal asphyxia is the occurrence of hypoxia or anoxia and hypercarbia during labor, delivery or the immediate newborn period resulting from inadequate perfusion or gas exchange through the maternal, placental, fetal, or neonatal circulations. (6) Common usage of the term "prenatal asphyxia" frequently makes it synonymous with fetal distress, whereas "neonatal asphyxia" or (asphyxia neonatorum) more specifically relates to hypoxia or anoxia and hypercarbia in the newborn infant. (7) From a clinical standpoint, the initial most striking feature of neonatal asphyxia is delayed onset of breathing at birth, followed by difficulty in making all of the physiologic transitions from intrauterine to extrauterine life. (8) Further

illustrating the distinction yet interconnection between the cardiovascular and respiratory aspects of asphyxia are the two following categories of hypoxia that can occur during asphyxia. (9) Anticipation of perinatal asphyxia allows time to make preparations to handle the emergency and for early intervention when countermeasures can be less invasive or extensive and more likely to be effective. (10) The required personnel can be called in the appropriate equipment and supplies assembled, and action assignments made in advance. Early interventions following precise awareness of when hypoxic – ischemic injury is imminent are key for prevention of morbidity and mortality in this situation. (11)

### Patients & methods:

Forty two newborns were diagnosed with HIEs by specialist pediatricians during admission to Children Welfare Teaching Hospital- Medial City- Baghdad and Al- Kut Hospital during the period from January 2008 to March 2009 were studied. Demogaphical and clinical risk factors that may have a role in the outcome of HIE (place of delivery sex, body weight, Apgar scores at 1 min, 5min 15min, meconium aspiration, muscle tone, lethargy, and convulsion) in fullterm neonates were studied and association of

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these factors with outcome were analysed by the use of Statgraph software descriptive statistics, Fishers exact was used with a p-value of <0.05 considered significant.

**Results:**

The total number studied who were forty two neonates. Half of them were born at home & others in hospital with a male / female ratio 1/1. Thirty three newborns had normal birth weight& nine had low birth weight. The mean Apgar score recorded for sixteen neonate born in hospital at 1 minute= 4.31± 1.922, at 5 minute= 6.06±2.08 and at 15 minute = 6.62±2.33. One third of hospital newborn babies had low birth weight while one tenth of home born had low birth weight. Apgar score 4-7 at 15 min was significantly associated with neonatal mortality. (p.value 0.08). Three newborns with Apgar < 4 at 1 minute died and one survived, but the difference between < 4 and ≥ 4at 1 minutewas not statistically significant p. value 0.1. Three newborns with Apgar scores < 4 at 1min died and one survived, while those with scores of 4< at 1min, 2 died and 12 improved. The difference was statistically significant, with a p value of 0.02. Five

newborn with apgar 4-7 at 5 minute died and 6 survived, but the difference between 4-7 and > 7 at 5 min was not statistically significant. P.value 0.13. Out of 21 male neonates, 6 died. Out of 21 female neonates, 4 died. The difference was not significant p. value 0.7. Although 4 out of 9 low birth weight babies with HIE died and 8 out of 33 normal birth weight died but the difference was not significant statistically. P value. 0.4. Three out of newborn with HIE and meconium aspiration died while 7 out of 34 without meconium aspiration died. The difference was not significant p. value 0.33. Two newborn out of 4 with HIE and convulsion died while 8 out of 38 without convulsion died. The difference was not statistically significant p. value. 0.1. Hypertonic scored a highly significant association with mortality in newborn with HIE. P value. 0.01. Lethargy was recorded in 17 newborns with HIE and 7 of them died, but those without lethargy were 25 newborns, 3 of them died but significant association was not scored. P value. 0.06. out of the 21 hospital born babies with HIE, 6 died and 15 improved and out of the 21 home born babies with HIE 4 died and 17 improved. The difference was not significant statistically. P value. 0.7.

**Table (1): The association between place and outcome of 42 full term newborns with HIE.**

Place of birth	Normal Birth Weight (NO.)	%	Low birth Weight (No.)	%	Total (NO.)	%	p-Value
Hospital Born	14	33	7	17	21	50	0.13
Home Born	19	45	2	5	21	50	
Total	33	78	9	22	42	100	

**Table (2): The association between Apgar scores at 1,5,15 minute and outcome in full term neonates with hypoxic ischemic encephalopathy.**

Apgar score at	Died (No.)	%	Improved (No.)	%	Total (No.)	%	p-Value
1 minute	<4	3	17	1	6	4	0.1
	≥4	2	10	12	67	14	
Total	5	27	13	73	18	100	
5 minute	4-7	5	31	6	38	11	0.133
	> 7	0	0	5	31	5	
Total	5	31	11	69	16	100	
15 minute	4-7	4	29	4	29	8	0.08
	> 7	0	0	6	43	6	
Total	4	29	10	72	14	100	

**Table (3): The association between possible predictors and outcome 42 full term newborn with HIE.**

Predictors		Died (No.)	%	Improve (No.)	%	Total (No.)	%	p- Value
Gender	Male	6	14	15	36	21	50	0.7205
	Female	4	9	17	41	21	50	
Birth Weight	Low birth weight	4	10	5	11	9	21	0.4057
		8	19	25	60	33	79	
	Normal birth weight	12	29	30	71	42	100	
Meconium Aspiration	Meconium Aspiration	3	6	5	10	8	16	0.3310
	No Meconium Aspiration	7	14	27	70	34	84	
Convulsion	Convulsion	2	4.7	2	4.7	4	9.5	0.1742
		8	19	30	71.6	38	90.5	
	No Convulsion	10	23.7	32	76.3	42	100	
Muscle tone	Hypertonic	3	10	1	3	4	13	0.0164
	Normal tone	3	10	24	77	27	87	
		6	20	25	80	31	100	
Muscle tone	Hypertonic	4	11	7	18	11	29	0.1607
	Normal tone	3	8	24	63	27	71	
		7	19	31	81	38	100	
Lethargy	Lethargic	7	17	10	24	17	40	0.0616
	Not Lethargic	3	7	22	52	25	60	
		10	24	32	76	42	100	

**Discussion:**

The Study showed that 9(21%) of neonate were low birth weight & 33(79%) were normal birth weight while Godambe et al(12) in India found that 67% of asphyxiated babies were low birth weight & 36.4% were normal birth weight, this can be explained by the fact that premature newborns who are usually low birth weight babies with RDS were excluded from this study to get rid of confounders regarding mortality related to complications of prematurity. Male/ Female ratio was 1:1 in this study but Finer et al (13) described a male/ female ratio of 2/1. In this study HIE occurred in home delivered newborns was 21 (50%) and hospital delivery was 21 (50%), but Godambe et al(12) found that 31% were home born and 64% were hospital born. Difficulties for hospital access during the period of a study may play a role here. A significant association between severe asphyxia (Apgar scores less than 4 at 1 min) and mortality was noted in this study. None of the studied newborns scored less than 3 at 5 min. newborn babies with Apgar scores of less than 7 at 5 minutes died more frequently than those with Apgar scores more than 7 at 5 minutes though statistical association was not achieved here. This might be attributed to the small number of cases and separation of variables (predictors) to avoid confounders which might make the results of this study less variable. Thornberg et al (14) study in Sweden described that Apgar score at 5 minute is rare. Stthivuddhi F et al (15) showed that Apgar score of < 3 at 5 minute is highly indicative for sever

birth asphyxia. Convulsion occurred in 4 babies (9.5%) & only two of them died. In Bergman et al study(18) convulsion occur in 22,7% and in Thornberg et al study all babies with convulsion were resistant to treatment & died, this is a recognized finding in this study. Finer et al study represented that 75% of asphyxiated neonates had convulsion had poor prognosis. Dubowitz et al (16) showed that convulsion occurred in 15% of the neonates while in levenet al(17) the full term babies died with convulsion were 80%. Meconium aspiration occurred in 8 asphyxiated babies (16%), 3 of them died while Shrestha et al (19) in Nepal found that 65% of asphyxiated neonate had meconium aspiration & also David Hall (20) et al described that 47% of asphyxiated babies had meconium aspiration. Starks study (21) showed that 42, 2 with meconium aspiration suffer from asphyxia and suggest that meconium aspiration by itself alone may not be an excellent maker of fetal distress. Katz study (22) showed that all babies with moderate or severe asphyxia development meconium aspiration and 83% with Apgar score less than 5 minute had meconium aspiration and also found 30, 7% developed meconium in mild or no asphyxia in normal fetal breathing. This might explain the fact that meconium aspiration was not found to reach statistical significance with mortality though asphyxiated newborns with meconium aspiration died more frequently than those without. Hospital born babies with HIE died more frequently

than home born. This might be explained by the fact that the need for hospital deliveries was more in complicated pregnancies which might end with more severely asphyxiated babies and worse outcome. In conclusions full term newborn babies with HIE died more frequently if they were males, with low birth weight, with Apgar scores of < 4 at 1 min., 4-7 at 5 and 15 min., meconium aspiration, convulsion, hypotonic. Hypertonia and lethargy were noticed to be associated significantly with perinatal mortality in newborns with HIE.

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