Original Article

Predictors of Adverse Outcome in Asphyxiated and Ventilated Late Preterm and Term Newborns

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Abstract

Objective; To assess the factors that modify the outcome among asphyxiated out born babies who needed ventilation in a tertiary care centre within 24 hours of life. **Study design;** Observational cross sectional study **Setting;** Extramural tertiary care neonatal unit, **Subjects:** Asphyxiated neonates of gestational age>34 weeks requiring ventilation **Methods;** 114 asphyxiated neonates were included in the study. Data regarding antenatal risk factors, delivery, stabilization and transport details, status of the baby on admission, course in hospital including time of initiation of ventilation and duration of ventilation and final outcome was obtained, Nested case control design was used to analyse and identify risk factors which modify outcome. **Results;** Adverse antenatal factors, p 0.02 OR 2.49(1.07 -5.85) low birth weight, [p 0.001] OR 5.78(1.62-21.68) and admission within 6 hours was found to be statistically significant as a predictor of poor outcome [p 0.02] 2.50(1.03-6.09) Hypothermia [p 0.04] OR 2.17(1.00 – 4.80)] on admission was also associated with a poor outcome. **Conclusion;** Lack of Pretransfer stabilization before transport increases the mortality among asphyxiated neonates. Pretransfer stabilization is absolutely essential in neonates before transport to referral centre

Key Words : Out born neonates; Asphyxia; Ventilation; Outcome

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Introduction

India accounts for 30 per cent of the neonatal deaths globally. In India, the neonatal mortality rate is 33/1,000 live births.[SRS 2010] Most of these deaths occur within the first days of life. 46.2 per cent occurring in the first two days of life and 73.3 per cent taking place within the first week of life.[Million Death Study, Lancet 2010][1] Sepsis and asphyxia are the major causes of death among extramural births. It has been estimated that health-facility based interventions can reduce neonatal mortality by as much as 25-30% (Lancet 365:977-88.] when problems are identified and managed early. This study was embarked upon to assess those factors that determine an adverse outcome among asphyxiated babies who needed ventilation and were referred to a tertiary level centre within 24 hours and also to identify modifiable factors affecting the outcome in case of asphyxiated neonates which may have an impact on bringing down the Neonatal mortality rate. Anticipation, recognition of problems and early referral of asphyxiated newborns to higher centers has been reiterated in several studies but this study emphasizes the need for proper stabilization before transfer and during transport to higher centers in order to ensure optimum survival of asphyxiated newborns.

Material and Methods

This observational study was conducted in the extramural Neonatal unit of the Institute of Child health, Chennai, Tamil Nadu. After obtaining the approval of our Institute review board, Madras Medical College the study was conducted over a nine month period (November 2010 –June 2011]). 114 Neonates of gestational age>34 weeks with asphyxia [based on referral diagnosis and clinical features] who were admitted within 24 hours and who required ventilation were included in this study. The details of the mother and the baby [parity, sex, birth weight] place of delivery, mode of delivery, and immediate postnatal events like Apgar score, resuscitation done, and other management given were recorded The mode of transport, temperature, capillary blood glucose [whenever available] and capillary refill time of the newborn at arrival were recorded. The respiratory distress score by Downe and oxygen saturation by pulse oximetry were also noted in the emergency room. All babies were treated based on standard management protocol. The, mode, duration and complications during ventilation were recorded. Parents were counseled though out their stay regarding the prognosis and disease progress. The outcome in each case was also noted and advice regarding follow up was given at discharge and in cases of death the parents were counseled to deal with grief. Results were analysed using the chi-squared test

Results

Out of the 114 babies who were included in the study, 65 babies survived and 49 died. Analysis of factors prior to birth [Table 1] revealed the presence of antenatal adverse factors in 34 of the discharged babies and in 31 of the babies who died [p 0.02] 2.49(1.07-5.85]. While 31 of the discharged babies and 18 babies who died had no antenatal risk factors in the form of prolonged 2nd stage of labour and meconium stained amniotic fluid. 78% [n=89] of the deliveries were in the State Health Facility with a small contribution from the private hospitals. Normal vaginal delivery was the type of delivery observed in 74 [65%] cases. Transport of the high risk babies was done by both Government ambulances [65%] and private vehicles [35%]. Place and type of delivery and the mode of transport did not affect the outcome. Considering the factors after birth,[Table 2] there were 76 males and 38 females in this study with majority of them being delivered at term[95%] 75 babies belonged to the average weight group, mortality being higher in the low birth weight group [p 0.001] 5.78(1.62-21.68).When the time of admission was taken into account[Table 3], it was found that those babies who were admitted within 6 hours of life had a higher mortality [p 0.02] 2.50(1.03-6.09). 73 [64%} babies were normothermic on admission and [45%} babies were hypothermic 77 [67%] babies had normal capillary glucose levels at admission, while 15 babies were hypoglycemic. Severe respiratory distress was present in 18[16%] of babies, while 56[50 %] babies were apneic! 76[66%] babies required intubation on arrival. Shock was observed in 66 [58%] babies. Babies were ventilated for varying periods ranging from 6 hours to more than one week. Cause of death in these babies was due to, HIE - 63% MAS/PPHN-27% Sepsis 10%

Discussion

Perinatal asphyxia continues to contribute to nearly 20% of the neonatal mortality rate. With the increase in institutional deliveries the rate of asphyxia should see a decline instead of remaining static. Factors which can be modified so as to minimize the impact of asphyxia at birth were identified in this study.

In this study it was observed that mothers who had problems during labor in the form of prolonged second stage and meconium stained liquor had higher neonatal mortality which was statistically significant [p 0.02] OR 2.49(1.07 -5.85) .This is comparable to the study by Christina et al[2] Since these deliveries were not in a tertiary level unit the incidence of maternal infection could not be assessed unlike the study from Estonia,[3] where maternal infection was associated with birth asphyxia. It was reported that caesarean sections were associated with increased respiratory morbidity [4].This was noticed in this study but it was not statistically significant.

Since only babies which were more than 34 weeks were included in the study gestational age did not contribute to the outcome but babies with low birth weight had higher mortality as in earlier studies[5,6] [p 0.001] OR 5.78(1.62-21.68)

Admission within 6 hours was found to be statistically significant as a predictor of poor outcome. [p 0.02] 2.50(1.03-6.09).This is unlike other studies[7-9] where early referral had better outcome. This could be due to the fact that these babies were transported before any pre transfer stabilization. The time for transfer varied from 30 minutes within the city to more than 4 hours from outside the city. The importance of pre transfer stabilization cannot be over emphasized as evident in multiple studies[10-12] Stabilization before transfer comprises two phases: (a) from when a decision to transfer is made until the transfer team arrives, during which care is delivered by the local staff; (b)during transport to the referral centre. The aim in both of these phases is to resuscitate and stabilize the infant till he reaches the referral point.[10]

Hypothermia [p 0.04] OR 2.17(1.00 – 4.80) at the time of admission which was a statistically significant predictive factor[13] also showed that these neonates were not stabilized before transfer and were rushed to the higher level of care. It was not possible to come to a conclusion about hypoxia, because we could not record pulse oximetry values in all cases. Severe respiratory distress and apnea on admission were present in 65% of babies and 76 [66%] babies had to be intubated on arrival. Airway management should have been done before referral.

Cause of death in these babies were due to, HIE iii - 63% MAS/PPHN-27%. Sepsis 10% .This is comparable to other studies[13,14]

Conclusions

Since antenatal risk factors may not be modifiable at a late stage, antenatal women who are at high risk should have access to tertiary neonatal care centers before labor since intra uterine transfer is the best option. Supervised care during labor will also reduce mortality among low birth weight babies. Prevention and early management of asphyxia in neonates is associated with an optimum outcome as studies have amply demonstrated. Although there is a need for early referral of asphyxiated neonates, they should be stabilized before referral to ensure complete recovery. In addition to the training imparted for neonatal resuscitation and management, training in pre transport stabilization and care during transport should also be imparted to staff at health care facility. This study highlights the need to train the health care providers to manage airway, blood glucose levels and temperature management. All neonates should be transported in controlled environment which necessitates fully equipped Ambulances available with trained staff. Ultimately the retrieving team should consist of a Medical officer trained in the management of neonates and a Neonatal Nurse Practitioner. Further large multicenter studies are required to include inborn errors, anomalies and blood chemistry to assess the cause, course and outcome of Neonatal admissions.

Tables

Table 1 Antenatal factors affecting outcome n=114 Discharged 65 Death 49

Variable		Discharged	Death	Chi square	p value	OR
AN risk factors	Presence	34	31	X2=5.37	0.02	2.49(1.07-5.85
	Absence	31	18			
Place of delivery	GH	21	13	X2=7.16	0.20	
	PHC	14	15			
	Corp	15	6			
	Private	13	12			
	ESI	02	1			
	Med college	0	2			
Type of delivery	Normal	42	32	X2=1.09	0.54	
	CS	14	13			
	Others	09	04			
Transport	EMRI	36	31	X2.0.72	0.69	
	Govt ambulance	05	03			
	Private vehicle	24	15			

Table 2 Factors affecting outcome n=114 Discharged 65 Death 49

Gender	Male	40	36	X2=1.79	0.18	
	Female	25	13			
Gestational age	Term	60	48	X2=2.13	0.54	
	35wks	1	0			
	36wks	3	1			
	37wks	1	0			
Birth weight	1.5-2.5kg 2.5-3kg >3kg	5 53 7	12 23 14	X2=10.27	0.001	5.78(1.62-21.68) 1 3.75[1.28-11.15]

Table3 Admission parameters affecting outcome n=114 Discharged 65 Death 49

Time of admission	<6hrs	44	34	X2=5.4	0.02	2.50(1.03-6.09)
	6-24hrs	21	15			
Temperature	Normal	43	30	X2=4.39	0.04	2.17(1.00-4.8]
	hypothermia	22	29			
	hyperthermia	0	0			
Spo2	Not recorded	09	15			
	Normal	22	20	2=3.24	0.07	0.45(0.17 -1.18)
	hypoxia	34	14			
CRT	Normal	27	23	X2=0.33	0.56	
	prolonged	38	26			
CBG	Not recorded	10	07	X2=3.98	0.26	
	Normal	47	30			
	hypoglycemia	07	08			
	hyperglycemia	01	04			
Respiratory distress	No RD	13	07	X2=6.56	0.09	
	Mild-mod	09	11			
	Severe	06	12			
	Apnea	37	19			
Seizures <24hrs	Presence	32	29	X2=1.11	0.29	
	Absence	33	20			
Intubation in ER	Presence	47	29	X2=2.17	0.14	
	Absence	18	20			
Vent hours	6-24hrs	14	11	X2=3.38	0.33	
	1-3days	18	19			
	4-7days	23	10			
	>7days	10	09			

Table 4 Cause of death n=49

HIE iii	31	63%
MAS/PPHN	13	27%
SEPSIS	5	10%

References

1) The Million Death Study Collaborators; Causes of neonatal and child mortality in India: a nationally survey Representative mortality Lancet 2010; 376: 1853–60

2) Christiana R Titaley, Michael J Dibley, Christine L Roberts; Type of delivery attendant, place of delivery and risk of early neonatal mortality: analyses of the1994-2007 Indonesia Demographic and Health Surveys.

3) Stelmach T, Kallas E, Pisarev H, Talvik T.; Antenatal Risk Factors Associated With Unfavorable Neurologic Status in Newborns and at 2 Years of Age (J Child Neurol 2004; 19:116—122).

4) F A Liston et al Neonatal outcomes with caesarean delivery at term. Arch Dis Child Fetal Neonatal Ed 2008; 93:F176-F182 doi:10.1136/adc.2006.11

5) Broughton Simon J et al; An illness severity score and neonatal mortality in retrieved neonates. Eur J Pediatr. 2004 Jul; 163(7):385–389
.

6) Armstrong Schellenberg et al; Effectiveness and cost of facility-based Integrated Management of Childhood Illness (IMCI) in Tanzania. Lancet. 364(9445):1583–1594.

7) Seyal T, Hanif A; Factors Related to Adverse Outcome in Asphyxiated Babies: ANNALS 2009 vol 15.no. 4 Oct. - Dec.

8) Abbasi KA, Mirani PH, Parsram, Sarwar A; Causes, clinical features and outcome of 150 newborns with birth asphyxia at Larkana Hospital. Pakistan J Pathol 1997; 8: 121-25.

9) Sultan T, Maqbool S. Does early referral to tertiary care decreases the mortality related to birth asphyxia. J Coll Physicians Surg Pak 2006; 16 (3): 220-2.Arch Dis Child. 2005 July; 90(7): 729–732.

10) S Moss, N Embleton, and A Fenton; Towards safer neonatal transfer: the importance of critical incident review Arch Dis Child. 2005 July; 90(7): 729–732.

11) Fanaroff AA MR. (ed). Neonatal–Perinatal Medicine, 7th edn, vol 1. St. Louis: Mosby 2002; p. 31 9–410.

12) Sutapa Bandyopadhyay Neogi, Sumit Malhotra, Sanjay Zodpey and Pavitra Mohan; Does Facility-Based Newborn Care Improve Neonatal Outcomes? A Review of Evidence Indian Pediatr 2012; 49: 651-658

13) Lee AC et al; Risk factors for neonatal mortality due to birth asphyxia in southern Nepal: a prospective, community-based cohort study. Pediatrics 2008 May; 121(5):e1381-90.

14) Rawat AK, Razia MV; Determinants of Adverse Outcome of Hospitalized Extramural Newborns Indian Pediatrics 2005: 501 vol 42 May17.

A new role for yellow pigment?

We all recognize bilirubin as the haem-derived pigment that imparts an unpleasant yellow colour to those afflicted with certain liver diseases and haemolytic anaemias. But most people fail to realise that it is not a waste product but a powerful anti-oxidant. In a new study carried out in University of Missouri, the researchers discovered that bilirubin could prevent or limit the extent of vascular damage in individuals at risk for occlusive cardiovascular disease. It does so by inhibiting the growth of vascular smooth muscle cells without killing them. However, as bilirubin is not soluble in water and is rather quickly digested when consumed orally,the challenge is to find a way to exploit this useful property of bilirubin therapeutically to check the largest killer. The authors' suggestion: coat the stents with bilirubin. (Frontiers in Pharmacology, 2012; 3 DOI: 10.3389/fphar.2012.00048)

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