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Research Article

Risk factors for adverse outcome in asphyxiated new born in Eastern Nepal

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ABSTRACT

Background: Birth asphyxia is the third leading cause of neonatal deaths in developing countries. The present study was an attempt to find out the various risk factors associated with mortality in these cases.
Methods: This was a retrospective hospital based analysis of data in neonates with birth asphyxia admitted during the period February 2010 to January 2011. The demographic profile and outcome were recorded.
Results: Of 285 neonates, there were 212 (74.4%) outborn and 73 (25.6%) cases were inborn. Male were 207 (72.6%) and female were 78 (27.4%). One hundred eighty eight (66%) came from rural area. Two hundred sixty six (93.3%) were full term and 19 (6.7%) were preterm. Thirty two (11.2%) were delivered at home and 253 (88.8%) were institutional delivery among which 54 (18.9%) babies were born by caesarean section while 215 (75.4%) were by normal vaginal delivery and 16 (5.6%).were instrumental delivery. Thirty eight (13.3%) were found to be normal while clinical signs of HIE were present in 247(86.7%) babies, out of those 48 (16.8%) babies were in stage I, 136 (47.7%) in Stage II and 63 (22.1%) in stage III of HIE. Fifty nine (20.7%) babies died during the hospital stay. The babies who were born at home (p=0.028, OR=2.472, 95% CI 1.104-5.536), prematurity (p=0.024, OR=3.154, 95% CI 1.166-8.528) and shock at the time of admission (p=0.035, OR=2.261, 95% CI 1.061-4.821) had higher risk of mortality.
Conclusions: Thus unsupervised delivery at home, prematurity and presence of shock at admission affected the outcome in these babies. Therefore, institutional delivery with facility to care preterm baby and immediate treatment of complications are needed for better survival.

Keywords: Birth asphyxia, Hypoxic ischemic encephalopathy, Mortality, New born

INTRODUCTION

The World Health Organization (WHO) defines birth asphyxia as failure to initiate and sustain breathing at birth.[1] It is the third major cause of neonatal death after infections and prematurity in developing countries and accounts for an estimated 23% of the annual 4 million neonatal deaths.[2] WHO estimates that 3% of the approximately 120 million infants born every year in developing countries develop birth asphyxia. Of these, an estimated 900,000 die each year.[3] The risk of dying due to birth asphyxia varies from country to countries, as babies in country with high neonatal mortality rate (NMR) countries have an estimated eight times higher risk than babies in low NMR settings.

Substantial numbers of children who survive birth asphyxia live with chronic neuro-developmental

morbidity, including cerebral palsy, mental retardation, and learning disabilities. A Hospital based studies in Nepal estimated that birth asphyxia accounted for 24% of perinatal mortality.[4]

Similarly another study from Southern Nepal documented 30% of neonatal mortality due to birth asphyxia. This study also showed maternal fever, prematurity, multiple birth and poor socio-economy as a risk factor for high mortality in asphyxiated newborn.[5]

According to American college of obstetricians and gynaecologists and the american academy of paediatrics, a neonate is labeled to be asphyxiated if the following conditions are fulfilled:

- Umbilical cord arterial pH <7;
- Apgar score of 0 to 3 for longer than 5 minutes;
- Neurological manifestations (e.g., seizures, coma, or hypotonia); and
- Multisystem organ dysfunction, e.g., cardiovascular, gastrointestinal, haematological, pulmonary, or renal system.[6]

The national neonatology forum of india has defined birth asphyxia as gasping and ineffective breathing or lack of breathing at 1 minute after birth.[7]

Neonatal deaths account for 40% of all deaths among children under five among which 80% neonatal deaths are due to prematurity and low-birth-weight, infections, asphyxia and birth trauma.[8]

So, by decreasing birth asphyxia related death we can significantly decrease under five mortality. Also an effective approach towards prevention is to identify and timely intervention of risk factors causing mortality in asphyxiated newborn.

Hence, this hospital based study was done to find out the associated risk factors for development of birth asphyxia related mortality in eastern region of Nepal.

METHODS

This was a retrospective study on newborns admitted with the diagnosis of birth asphyxia in the Department of Paediatrics and Adolescent Medicine, B P Koirala Institute of Health Sciences (B.P.K.I.H.S), Dharan, Nepal over a period of one year from February 2010 to January 2011.

It is a tertiary center which has well equipped Paediatric department including Neonatal Intensive Care Unit where both inborn and outborn neonates are admitted.

We reviewed records of consecutive 285 asphyxiated neonates who satisfied the inclusion criteria. Inclusion criteria were newborns having clinical history consistent with birth asphyxia (delayed cry or 5 minutes Apgar score <7, or need of resuscitation for >10 minutes).

While the exclusion criteria were babies having delayed cry or low APGAR score due to prematurity with <34 weeks, birth weight <1500g, intra cranial bleeding, major congenital malformations, sever hyperbilirubinemia, low apgar score due to general anesthesia during cesarean section, hypoglycemia or meningitis.

Babies were categorized into different stages of Hypoxic Ischemic Encephalopathy (HIE) according to Sarnat and Sarnat staging.[9]

On the basis of outcome, they were divided into two groups - survival and non-survival.

Effect of various factors such as gender, gestation, time of arrival to hospital, place of residency, duration of stay, inborn/outborn, parity, mode of delivery, place of delivery, severity of HIE, birth weight, prolong rupture of membrane and shock at the time of admission on both groups were compared.

Statistical analysis

Statistical program for Social Sciences (SPSS) 11.5 version was used for all statistical calculation. Chi-quare (X2) test was used for categorical variables. Variables which had p <0.2 were subsequently put on forward stepwise methods of binary logistic regression used to find out the significant predictors of risk factor of mortality. A p value of <0.05 was considered as significant.

RESULTS

Of 387 neonates, 285 cases with birth asphyxia satisfied the inclusion criteria. The various factors affecting the outcome are presented in Table 1. It was found that prematurity (p=0.034), hospital stay <72 hours (p=0.036), place of delivery at home (p=0.013) and presence of shock at admission (p=0.047) were significantly associated with mortality.

The data of forward conditional stepwise method of binary logistic regression analysis were shown in Table 2. Place of delivery outside the hospital at home (p=0.028, OR=2.472, 95% CI 1.104-5.536), prematurity (p=0.024, OR=3.154, 95% CI 1.166-8.528) and shock at the time of hospitalization (p=0.035, OR=2.261, 95% CI 1.061-4.821) were found to be significantly affecting the outcome.

Table 1: Various factors associated with outcome.

Characteristics	Categories	Survival		P value
		Yes	No	
Gender	Male	163(78.7%)	44(21.3%)	0.707
	Female	63(80.8%)	15(19.2%)	
Gestation	Preterm	11(57.9%)	8(42.1%)	0.034*
	Term	215(80.8%)	51(19.2%)	
Time of arrival to hospital in hours	<24	111(79.3%)	29(20.7%)	0.996
	≥24	115(79.3%)	30(20.7%)	
Rural/urban habitation	Rural	152(80.9%)	36(19.1%)	0.368
	Urban	74(76.3%)	23(23.7%)	
Duration of stay in hours	<72	59(71.1%)	24(28.9%)	0.028
	≥72	167(82.7%)	23(17.3%)	
Inborn/Outborn	Inborn	57(78.1%)	16(21.9%)	0.766
	Outborn	169(79.7%)	43(20.3%)	
Parity	Primi	151(78.2%)	42(21.8%)	0.522
	Multi	75(81.5%)	17(18.5%)	
Mode of delivery	SVD**	170(79.1%)	45(20.9%)	0.951
	Instrumental	14(87.5%)	2(12.5%)	
	LSCS***	42(77.8%)	12(22.2%)	
Place of delivery	Home	20(62.5%)	12(37.5%)	0.013
	Hospital	206(81.4%)	47(18.6%)	
HIE**	Absent	29(76.3%)	9(23.7%)	0.626
	Present	197(79.8%)	50(20.2%)	
HIE- Grading	No	29(76.3%)	9(23.7%)	0.599
	I	36(75.0%)	12(25.0%)	
	II	112(82.4%)	24(17.6%)	
	III	49(77.8%)	14(22.2%)	
Shock at the time of admission	Yes	27(67.5%)	13(32.5%)	0.047
	No	199(81.2%)	46(18.8%)	
Birth weight in grams	≥2500	165(81.7%)	37(18.3%)	0.121
	1500 to 2500	61(73.5%)	22(26.5%)	
PROM *****	Yes	59(78.7%)	16(21.3%)	0.875
	No	167(79.5%)	43(20.5%)	

* Fisher's Exact χ^2; **SVD- Spontaneous Vaginal Delivery, ***LSCS- Lower Segment Caesarian Section,**** HIE- Hypoxic Ischemic Encephalopathy, *****PROM- Prolong Rupture of Membrane.

Table 2: Risk factors for mortality in asphyxiated babies using (forward conditional methods) logistic regression.

Steps	Variables	Categories	ß coefficient	p-value	Adjusted OR	95% CI for adj OR	
						Lower	Upper
Step 1	Place of delivery	Hospital	Ref				
		Home	0.967	0.015	2.63	1.202	5.752
Step 2	Place of delivery	Hospital	Ref				
		Home	0.909	0.025	2.483	1.121	5.496
	Term/ Preterm	Term	Ref				
		Pre term	1.043	0.036	2.839	1.068	7.545
Step 3	Place of delivery	Hospital	Ref				
		Home	0.905	0.028	2.472	1.104	5.536
	Term/ Preterm	Term	Ref				
		Preterm	1.149	0.024	3.154	1.166	8.528
	Shock at the time of admission	No	Ref				
		Yes	0.816	0.035	2.261	1.061	4.821

DISCUSSION

The three major contributing factors affecting the outcome in asphyxiated neonate in our study were unattended home delivery, shock at the time of admission and shorter hospital stay <72 hours. Skilled attendant at health facilities can manage the complication or refer the mother early to higher center to prevent perinatal asphyxia and neonatal death due to complications of pregnancy. The 2011 national survey of Nepal reported that 65% of deliveries take place at home and only 36% of birth occurred in the presence of skilled birth attendant.[10] A prospective community based cohort study done in Nepal reported that delivery at home were associated with a higher risk of birth asphyxia mortality.[5] A study by Okolo and Omene in Benin city showed that neonatal mortality was reduced from 49.5/1000 live births to 16.4/1000 from the 1974 to 1981 just by the reduction of birth asphyxia in term neonates.[11] This could be unavailability of skilled attendant at the time of delivery at home. Increasing the percentage of births delivered in health facilities is important for reducing deaths due to asphyxia which ultimately help to reduce the neonatal mortality.

A prospective community based cohort study in southern Nepal showed that prematurity carried a higher risk of birth asphyxia related mortality. This study demonstrated that decreasing gestational age, the risk increases from 1.6 to 14.33 (34 to 37 weeks Vs. 34 weeks).[5] Similarly, a hospital based study in Malawi reported that the case fatality for asphyxiated premature infants was 66.7% versus birth asphyxia alone (25%).[12] Another study in India revealed asphyxiated prematurity as the most significant determinant of mortality.[13] These finding were consistent with the finding of the present study. Elevation in cytokines and chemokine's have been reported in the serum of asphyxiated neonates and premature infants are more vulnerable to cytokine induced damage due to the immaturity of their blood brain barrier could be the reason for high mortality in asphyxiated preterm neonates.[14-17]

There was significance different of mortality in asphyxiated newborn who presented with shock at the time of presentation in the present study. Infants with perinatal asphyxia may have transient myocardial ischemia which may present as a shock.[18] In a study of moderately to severely asphyxiated newborns, ventricular dysfunction has been demonstrated.[19] Further it has been also showed that that persistently low cardiac output during the first 48 hours of life, in newborns with cardiogenic shock due to perinatal asphyxia was associated with a significantly higher mortality.[20] This shows that a timely intervention to manage shock is needed to prevent mortality. In the present study most of the newborns were outborn who had shock at the time of admission. Time taken to reach the hospital further delays the management of shock result to high mortality in asphyxiated baby. Thus, it still appears that in developing countries institutional deliveries should be promoted so that effective interventions can be provided in order to reduce the incidence of birth asphyxia and its related complications. This will have long term impact in reduction of neonatal mortality and improve child survival.

CONCLUSION

Within the constraints of retrospective study, it can be concluded that home delivery, prematurity and presence of complication such as shock adversely affected the outcome in asphyxiated newborn.

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