

Factors Related to Adverse Outcome in Asphyxiated Babies:

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To determine the selected antenatal and perinatal risk factors (weight, sex, gestational age, maternal age, parity, mode of delivery, place of delivery, age at arrival and stage of hypoxic ischemic encephalopathy) for adverse outcome in babies with birth asphyxia, at Sir Ganga Ram Hospital, Lahore. This was an observational study conducted in a prospective manner in the neonatology unit of the department of Paediatrics, Fatima Jinnah Medical College/Sir Ganga Ram Hospital, Lahore, over a period of six months from 1st August, 2007 to 31st Jan. 2008. This study included 144 consecutive asphyxiated neonates who were admitted in our neonatal unit and fulfilled the inclusion criteria. Detailed maternal information, physical examination and progress of the babies were noted regularly till the time of death or discharge and entered into a specified proforma. Babies were categorized into different stages of HIE (Hypoxic Ischemic Encephalopathy) according to Sarnat and Sarnat staging. On the basis of outcome, they were divided into two groups, group one who survived and were discharged with stable vital signs and group two, who died. Effect of risk factors on both groups were compared and results were expressed as ($P < 0.05$ was taken significant) by using chi-square test.

Results: Total admissions during the study period were 650. One hundred and forty four (22%) suffered birth asphyxia. Out of one hundred and forty four asphyxiated babies forty five (31.3%) were females and ninety nine (68.8%) were males. Ninety three (64.6%) weighed > 2.5 kg and fifty one (35.4%) 1.5-2.5 kg. 15 (10.4%) babies of birth asphyxia did not suffer HIE, 53(36.8%) had stage I, 46 (32.0%) stage II and 30 (20.8%) stage III HIE. 86 (59.7%) of the babies were discharged successfully and 58 (40.3%) died. Variables (risk factors) found significantly affecting adverse outcome were late arrival and severe birth asphyxia.

Conclusion: Referring high risk pregnancies to tertiary care hospitals is not enough because these centers and neonatal units have their own limitations so more attention should be paid to prevention.

Key words: Birth Asphyxia, Hypoxic Ischemic Encephalopathy, Adverse outcome.

Introduction

Almost one million new borns die every year due to birth asphyxia and another 1.1 million intrapartum stillbirths are associated with birth asphyxia¹ as well as unknown burden of long term neurological disability and impairment. This is the size of a health emergency that is unfortunately under estimated and often even unrecognized in the developing countries. Over half of neonatal deaths occur at home in the absence of skilled care and just three major causes account for over three quarters of these deaths – serious infections including tetanus (36%), complications of preterm births (27%) and birth asphyxia (23%).²

In Pakistan, current estimates for perinatal mortality range from 50-90/1000 total births.³ Still births constitute almost half of all perinatal deaths with the majority due to intrapartum still births. Important causes for perinatal mortality are intrapartum and birth asphyxia.²² 15 to 20% of infants with hypoxic ischemic encephalopathy (HIE) die in the neonatal period and 25-30% of survivors are left with permanent neurodevelopmental abnormalities (cerebral palsy, mental retardation).⁴ The major causes of neonatal deaths globally were estimated to be infections (35%), pre-term births (28%) and asphyxia (23%).⁵

The incidence of birth asphyxia depends largely on the definition used to diagnose the condition as well as gesta-

tional age of the infant. Incidence of HIE is 2-9/1000 live term births.⁶

Essential characteristics are defined by the American Academy of Pediatrics (AAP) and the American College of Obstetrician and Gynecologists (ACOG).

1. Profound metabolic or mixed acidemia ($\text{pH} < 7.00$) on umbilical cord arterial blood sample if obtained.
2. Persistence of an apgar score of 0-3 at > 5 min.
3. Neurological manifestations in the immediate neonatal period to include seizures, hypotonia, coma or HIE.
4. Evidence of multiorgan dysfunction in immediate neonatal period.

The aim of this study is to determine the selected antenatal and perinatal risk factors (weight, sex, gestational age, mode of delivery, place of delivery, parity, age at arrival and stage of HIE) for adverse outcome in babies with birth asphyxia at Sir Ganga Ram Hospital.

Patients and Methods

This was an observational study, conducted in a prospective manner in the neonatology unit of the department of Paediatrics, Fatima Jinnah Medical College/Sir Ganga Ram Hospital, and Lahore over a period of six months from 1st August 2007 to 31st Jan. 2008.

We studied 144 consecutive asphyxiated neonates who were admitted in our neonatal unit and fulfilled the inclusion criteria. Total number of admissions during this period was 650.

Inclusion Criteria

- History of delayed cry and history of fetal distress (this mainly determined birth asphyxia in home delivered cases especially if liquor/baby was meconium stained).
- Apgar score <7 at 5 min of life.

Exclusion Criteria

- Preterms with < 34 weeks of gestation.
- Preterms with < 1500 gms birth weight.
- Respiratory depression due to intracranial bleeding.
- Neonates with major congenital malformations of cardiovascular, central nervous system, respiratory system or dysmorphic babies.
- Severe hyperbilirubinemia bordering on kernicterus.
- Cases with hypoglycemia or meningitis as a cause of encephalopathy.⁷

Detailed maternal history was taken from the available maternal / hospital record and attendant for the enrolled cases including their age, gestational age, parity, place and time of birth and mode of delivery.

Referral notes were also consulted. The babies were examined in detail and then progress was noted regularly till the time of discharge or death and categorized into stages of hypoxic ischemic encephalopathy (HIE) according to Sarnat and Sarnat staging.⁷ According to which HIE is categorized into mild, moderate or severe as follows:

All the information was entered into a structured proforma. Outcome was noted and on the basis of outcome, 2 groups were formed, a group of babies who survived and 2nd group of babies who expired. Factors (weight, sex, gestational age, maternal age, parity, mode of delivery, place of delivery, age at arrival, stage of HIE and duration of stay in the hospital) affecting both groups were compared. Group of survivors included babies who were discharged successfully, were taking feed and had stable vital signs.

SARNAT AND SARNAT STAGING OF HIE

Stage I	Stage II	Stage III
Irritability Hyper alert Normal tone	Lethargy Seizures Differential tone (legs>arms) (neck extensors>flexors)	Coma Prolonged seizures Severe hypotonia
Weak suck Sympathetic Dominance	Poor suck, requires tube feeds Parasympathetic Dominance	No sucking reflex Coma, requires respiratory support

Chi-square (X^2) test was used to find out P value for statistical significance of the variables affecting the outcome. P value <0.05 was taken significant.

Results

Total number of admissions during a study period (6 month) was 650; percentage of birth asphyxia among total admission was 144 (22%).

Out of 144 asphyxiated babies 99(68.8%) were males and 45 (31.3%) were females. Table 1: ninety three (64.6%) weighed > 2.5 kg and 51 (35.4%) 1.5 – 2.5 kg. hundred and ten (76.4%) were born full term and thirty four (23.6%) were preterm.

Fifteen (10.4%) babies of birth asphyxia did not suffer hypoxic ischemic encephalopathy (meaning thereby those babies admitted with suspicions of HIE but after few hours of stabilization, they turned normal with normal activity, tone and neonatal reflexes-started taking oral feeding and remained well for next two to three days when they were discharged) fifty three (36.8%) had stage I, forty six (32.0%) stage II and 30(20.8%) stage III hypoxic ischemia encephalopathy (Table 1).

Eighty six (59.7%) of the babies were discharged successfully and fifty eight (40.3%) died (Table 2).

Variables(risk factors) studied, affecting the outcome were, weight, sex, gestational age, maternal age, parity, mode of delivery, place of delivery, age at arrival, stage of hypoxic ischemic encephalopathy and duration of stay in the hospital.

Late arrival and severe birth asphyxia (Stage III HIE) had poor outcome (Table 2, 3).

Table 1: HIE (Hypoxic Ischemic Encephalopathy).

Sex	HIE Stages				Total
	No HIE	Stage I	Stage II	Stage III	
Female	4	18	17	6	45 (31.25%)
Male	11	35	29	24	99 (68.75%)
Total	15 (10.40%)	53 (36.80%)	46 (32%)	30 (20.80%)	144

Discussion

Our data highlights the importance of early referral and severity of asphyxia (according to Sarnat and Sarnat staging) in the outcome of babies with birth asphyxia. About 80 (63%) of the babies who were brought to our neonatal unit within 4 hours of

birth, were discharged successfully. In this regard, result is similar to multiple studies,⁸⁻¹¹ which also show that early referral is an important factor for better outcome.

Although substantial work has been done on this topic world wide and many local studies are also available where almost all cases of birth asphyxia were referrals from homes or private clinics where birth facilities like skilled birth attendants, resuscitation and referral of the sick new born were lacking. But no data is available from this tertiary care hospital where more than 80% of the admissions to neonatal unit are delivered. This health facility provides adequate care to the women and new borns. Our hypothesis was that frequency of birth asphyxia would be much low as compared to other local studies which is proven true because our results showed frequency of 22% which is high if one compares it to a study¹⁹ from Saudi Arabia, but is much lower than local studies like^{8,20} where all cases were out born and referred. So the factors like prenatal care, risk identification and obstetric care can effectively reduce perinatal mortality. But strikingly cumulative mortality is 40.27% which is high in contrast to other studies,^{12,13} but even higher when compared to a study¹⁴ from Nepal. However, mortality of our study is consistent with other studies^{8,15,16} and is contributed mainly by stage-III¹⁷ and half of the stage-II hypoxic ischemic encephalopathy cases which is similar to the study⁸ from Mayo Hospital, Lahore. I suppose, despite the seemingly appropriate quantity of care provided for resuscitation of the sick newborns and their referral, the quality may have been suboptimal. Another reason could be that women might never have undergone antinatal checkups or were recognized and referred very late as high risk cases because women who receive inadequate prenatal care are at risk for perinatal complications. The major barriers to prenatal care are poverty, lack of knowledge about importance of prenatal care (illiteracy), inadequate social and family support and cultural issues.

Half of the cases in our data are emergency caesarean deliveries. This makes our study different from another hospital based study,¹⁸ where only 14% of the deliveries were caesarean cases. But our results are similar to a study from Paris¹¹ where 53%

Table 2: Factors affecting the outcome n = 144.

	Discharged	Expired	Statistical Significant
Age at arrival			P value = 0.000
0 – 4 hours	80 (63%)	47 (37%)	
> 4 – 24 hours	6 (35.3%)	11 (64.7%)	
Stage of HIE			P value = 0.000
No Encephalopathy	15 (100%)	0	
Stage I	51 (96.22%)	2 (3.78%)	
Stage II	20 (43.48%)	26 (56.52%)	
Stage III	0	30 (100%)	
Total	86 (59.72%)	58 (40.28%)	
Duration of Stay			P value = 0.000
< 24 hours	2 (13.33%)	13 (86.67%)	
24 – 48 hours	6 (19.36%)	25 (80.64%)	
>2 – 7 days	55 (75.34%)	18 (24.66%)	
>7 days	23 (92%)	2 (8%)	

Table 3: n = 144

	Discharged	Expired	Statistical Significant
Weight			P value = 0.847
>2.5 kg	55 (59.14%)	38 (40.86%)	
1.5 – 2.5 kg	31 (60.79%)	20 (39.21%)	
Maternal Age			P value = 0.784
< 20 year	4 (66.67%)	2 (33.33%)	
20 – 30 years	67 (60.91%)	43 (39.09%)	
>30 – 35 year	13 (56.52%)	10 (43.48%)	
>35 year	2 (40%)	3 (60%)	
Gestational age			P value = 0.356
Full term	68 (61.81%)	42 (38.19%)	
Preterm(<37-34weeks)	18 (52.95%)	16 (42.05%)	
Mode of Delivery			P value = 0.07
Caesarean	48 (68.57%)	22 (31.45%)	
Instrumental	2 (33.33%)	4 (66.66%)	
S.V.D.	36 (53%)	32 (47%)	
Parity			P value = 0.279
1 st issue	29 (56.87%)	22 (43.13%)	
2 nd and up to 3 rd	36 (67.92%)	17 (32.68%)	
4 th issue or more	21 (52.5%)	19 (47.5%)	
Place of delivery			P value = 0.144
i) SGRH	62 (61.39%)	39 (38.61%)	
ii) Private clinics	21 (61.11%)	11 (38.89%)	
iii) Other tertiary care hospitals	1 (58.8%)	3 (44.19%)	
iv) Home	2 (28.57%)	5 (71.92%)	

SVD (Spontaneous vaginal delivery)

SGRH (Sir Ganga Ram Hospital)

of the infants (birth asphyxia) were born by caesarean section. Itoo BA et al from Madinah¹⁹ found that deliveries by emergency caesarean section or the use of instruments was significantly higher in the study group.

Majority of stage-III hypoxic ischemic encephalopathy cases remained admitted for < 48 hours, showing that once severe asphyxia occurs, treatment in nursery cannot be very effective so more attention needs to be paid to prevention which is possible only through increasing awareness level and early recognition of high risk pregnancy at the community level, facilitating referral systems and timely decision for mode of delivery at tertiary care hospitals. However, prevention and management of birth asphyxia are much more complex at the community level and previously the published evidence was scanty²⁶. But for the past few years extensive community based work is being done by WHO (World health organization) in collaboration with the developing countries where this problem of birth asphyxia is high like Pakistan.²⁸⁻³¹ All these efforts are being done to improve the understanding of epidemiology of birth asphyxia in the poorest areas and to develop a uniform definition and specific diagnostic criteria which would permit the identification of the problem even without sophisticated instruments.

Almost 80% of the deliveries take place at home in our community where skilled and trained personnel as well as paediatric supervision is lacking.²⁵ In our community antenatal care coverage is 36% and skilled attendant at delivery is 31%.²⁴ While it has been proven that intervention makes a difference by a study²⁷ which is done in the Cirebon district of Indonesia where community midwives train to resuscitate newborns delivered at home using a basic locally produced tube and mask device. The study evaluated the impact on asphyxia specific newborn mortality and found 47% decrease in neonatal mortality due to birth asphyxia.

Male predominance is the same as shown by other studies.^{9,21,22}

Birth weight, gestational age, parity and maternal age are not significant determinants of adverse outcome, similar to a study²³ from Jordan.

Conclusion

Babies with birth asphyxia, who were referred in less than four hours time to a tertiary care hospital had better outcome. In order to reduce morbidity and mortality in asphyxiated babies, anticipation, recognition and early/timely referral is mandatory.

Recommendations

1. Traditional birth attendants should be trained to recognize high risk pregnancies, their timely referral should be facilitated as well as a timely decision of mode of delivery and that too, in presence of pediatrician.
2. All health workers need to be sensitized about the burden of this problem.

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