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Clinical Manifestations and Outcome of Hospitalised Babies with Birth Asphyxia in Sagamu

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Abstract

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Background: Birth asphyxia is a leading cause of neonatal morbidity and mortality in developing countries of the world but there is inadequate local data.
Objectives: To study the clinical course of neonates hospitalised with birth asphyxia, document the pattern of morbidity, and determine the risk factors for mortality among them.
Methods: Cases of birth asphyxia admitted to the neonatal unit of Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, a tertiary health institution located in south-western Nigeria, were prospectively studied. The relevant prenatal/perinatal history, presenting features, clinical course, laboratory findings and outcome of treatment were recorded for analysis. Possible risk factors for mortality were explored using multiple regression analysis.
Results: There were 459 neonatal admissions over the 18-month period of study. One hundred and fourteen (24.8 percent) of these were cases of birth asphyxia. The male to female ratio was 1.9:1 and mean (SD) bodyweight, 2.8 (0.8) kg. Thirty seven percent of the 81 babies for whom gestational age was recorded, were preterm. Maternal hypertension, toxaemia of pregnancy and prolonged labour were the major prenatal factors associated with birth asphyxia. Common complications observed among the patients included hypoxic-ischemic encephalopathy, metabolic acidosis, hypoglycaemia, transient renal insufficiency and hypocalcaemia. Seventy seven (67.5 percent) babies were discharged in satisfactory condition while the case fatality rate was 29.8 percent with prematurity, deep coma at presentation and concurrent anaemia emerging as significant predictors of mortality.
Conclusion: Mortality was high among infants hospitalised for birth asphyxia in this study. The major risk factors identified included prematurity, severe encephalopathy and anaemia.

Introduction

BIRTH asphyxia is clinically defined as the failure of the newborn to initiate and sustain spontaneous respiration at birth.[1] It constitutes a major threat to the survival of newborn babies worldwide. The impairment of oxygen delivery to the brain and other vital organs that is characteristic of this neonatal disorder has been associated with significant morbidity and mortality among affected babies. Current estimates suggest that between four and nine million newborns worldwide, develop birth asphyxia every year, and about 1.2 million of these die, while a similar proportion develop severe consequences such as epilepsy, cerebral palsy, and developmental delay.[2] Most asphyxia-related deaths occur in developing countries of the world where it has been estimated that birth asphyxia accounts for up to 33-37 percent of neonatal mortality.[3,4] It has therefore been argued that reducing neonatal deaths due to birth asphyxia may be critical for reaching the Millennium Development Goal no. 4 target of two-thirds reduction in under-5 mortality by the year 2015.[5] Furthermore, the need to address existing research gaps in relation to birth asphyxia, particularly in developing countries has been pointed out.[6]
The present study was designed to analyse the clinical course and outcome of treatment of hospitalised asphyxiated babies with a view to defining risk factors for mortality among affected babies.

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Subjects and Methods

The study was conducted at the Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, between May 2005 and November 2006. Babies aged 0-7 days presenting for admission into the neonatal ward (i.e. Special Care Baby Unit) were consecutively recruited for the study if they had (i) a documented Apgar score lower than 7 at 1 or 5 minutes, and/or (ii) a history of failure to cry within one minute after birth, and/or (iii) undergone resuscitative procedures within five minutes of birth. Babies with obvious congenital anomalies were excluded.

The data obtained on each patient upon admission included bio-data, place and mode of delivery, maternal demographic data, pregnancy, labour history and clinical features at presentation. Clinical progress of the patient was thereafter monitored on a daily basis till discharge and laboratory data were compiled. The duration of hospitalization and outcome of treatment were also documented. Ethical approval for the study was obtained from the Ethical Committee of the hospital.

Statistical analysis was carried out using EPI Info version 6. Observed differences among patients' groups were subjected to comparison using the Risk Ratio (RR) and 95% Confidence Interval (CI). Chi-square test was also used to test for association between categorical variables while multiple regression analysis was carried out to identify independent risk factors. P values < 0.05 and CI which did not include unity were considered statistically significant.

Results

Out of 459 admissions during the period of study, 114 (24.8 percent) had birth asphyxia. Fifty three (46.5 percent) were admitted from the labour ward of the hospital (inborn) while the remaining 61 (53.5 percent) were referred from other health facilities or traditional birth homes (outborn). There were 74 males compared to 40 females, a male: female ratio of 1.9:1.

The age of the patients at the point of admission ranged from 0.3 to 144 hours with a mean (SD) of 17.5 (27.5) hours. The distribution of the patients according to body weight is presented in Table I. The mean (SD) weight at presentation was 2.8 (0.8) kg. Out of the 81 babies for whom gestational age could be estimated, 49 (69.5 percent) were full-term, 30 (37.0 percent) were preterm babies while two (2.5 percent) babies were post-term. A majority of the babies (103; 90.4 percent) were singletons with 11 (9.6 percent) being product of twin gestations. Table II presents the distribution of patients according to the place of birth. Sixteen (14.0 percent) babies were born at centres like Traditional Birth Homes, family homes and church clinics that lacked trained birth attendants.

The mean (SD) maternal age was 28.7 (5.1) years. Of the 99 mothers for whom parity was documented, 57 (57.6 percent) were primiparous and five (5.1 percent) were grand-multiparous. The parity of the others ranged from two to four. Eighty four (73.7 percent) mothers received antenatal care, while 30 (26.3 percent) did not. Prolonged labour, maternal

Table 1

Babies' Weights at Presentation

Weight (kg)	*Inborn* *n (%)*	*Outborn* *n (%)*	*Total* *n (%)*
<1	0 (0)	2 (3.3)	2 (1.7)
1-1.49	5 (9.4)	5 (8.2)	10 (8.8)
1.5-2.49	14 (26.4)	10 (16.4)	24 (21.1)
2.5-3.99	33 (62.3)	42 (68.8)	75 (65.8)
>4	1 (1.9)	2 (3.3)	3 (2.6)
Total	53 (100)	61 (100)	114 (100)

Table II

Places of Delivery of 114 Neonates

Place of Delivery	*No. of Patients (%)*
OOUTH	53 (46.5)
General/private hospitals	39 (34.2)
TBA centres	9 (7.9)
Family homes	6 (5.3)
Maternity homes	5 (4.4)
Church clinics	2 (1.7)

hypertension and eclampsia were major prenatal factors associated with birth asphyxia in this study, having been observed in 59 (51.8 percent), eight (7 percent) and three (2.6 percent) cases, respectively. The mode of delivery was spontaneous vertex delivery (SVD) for 72 (63.2 percent) babies, Caesarean section for 37 (34.2 percent), breech delivery for two (1.8 percent) and vacuum extraction for one (0.9 percent) baby.

As shown in Table III, the most frequently observed presenting feature was poor suck and inability to feed which occurred in 80 (70.1 percent) patients. Thirty-two (28.1 percent) babies presented with an altered state of consciousness while cyanosis, seizures and high pitched cry were observed in 25 (21.9 percent), 21 (18.4 percent) and 12 (10.5 percent) patients, respectively. Other clinical features are listed in the table.

Metabolic disorders observed among the patients included metabolic acidosis, hypoglycaemia and hypocalcaemia. These were seen in 58.5 percent, 41.8 percent and 80.6 percent, respectively. Forty six (40.4 percent) babies had transient renal insufficiency. Meconium aspiration occurred in nine (7.9 percent) cases, while 23 (20.2 percent) had neonatal sepsis. Seven (6.1 percent) patients had both meconium aspiration and neonatal sepsis. Concurrent anaemia occurred in 40 (35.1 percent) patients, their packed cell volume being less than 40 percent.

In terms of outcome, 77 (67.5 percent) babies responded well to treatment and were discharged home, while three (2.6 percent) babies were discharged against medical advice. The mean (SD) duration of hospital stay was 11.3 (6.9) days. Thirty four babies died, giving a Case Fatality Rate (CFR) of 29.8 percent. Fifteen (44.1 percent) of those that died did so within 24 hours of admission. Mortality was significantly higher among out-born babies compared to the inborn (39.3 percent Vs 18.9 percent; RR = 2.08; 95% CI = 1.10 – 3.95). Similarly, low birth weight patients had a double-fold risk of mortality compared to their counterparts with normal birth weights (45.7 percent vs 22.7 percent; RR = 2.02; 95% CI = 1.16 – 3.50). Cyanosis at presentation was also associated with more than a

Table III

Clinical Features at Presentation

Feature	*Inborn N=53*		*Outborn N=61*		*Total N=114*	
	No.	*(%)*	*No*	*(%)*	*No*	*(%)*
Poor suck	25	(47.2)	55	(90.2)	80	(70.2)
Hypothermia	20	(37.7)	39	(63.9)	59	(51.8)
Altered sensorium	6	(11.3)	26	(42.6)	32	(28.1)
Cyanosis	4	(7.5)	21	(34.4)	25	(21.9)
Seizures	0	(0)	21	(34.4)	21	(18.4)
High-pitched cry	3	(5.7)	9	(14.8)	12	(10.5)

** Some babies presented with more than one clinical feature*

Table IV

Comparison of Clinical Parameters in Fatalities and Survivors

Parameters	*Fatalities (n =34)*		*Survivors (n=77)*		*X²; p value*
	No	*%*	*No*	*%*	
Prematurity (EGA<37wks)	15	44.1	15	19.5	7.259; 0.007*
Caesarean section delivery	9	26.5	28	36.4	1.039; 0.308
Low birth weight	16	47.0	18	23.4	6.225; 0.013 *
Delivery in OOUTH	10	29.4	41	53.2	5.395; 0.02*
Delivery at omorthoiox centres	5	14.7	11	14.3	0.003; 0.954
Age at presentation >24 hours	6	17.6	17	22.1	0.007; 0.595
Prolonged labour	7	20.6	25	32.5	1.622; 0.203
Maternal primiparity	15	44.1	40	51.9	0.579; 0.447
Unbooked pregnancy	5	14.7	20	25.9	1.716; 0.190
Hypothermia on admission	13	38.2	19	24.7	2. 114; 0.146
Altered sensorium	15	44.1	15	19.5	7.259; 0.007*
Abnormal cry	24	70.6	36	6.8	5.359; 0.02*
Cyanosed	13	38.2	9	11.7	10.459; 0.001*
Abnormal resp rate (<40 or >60/min)	17	50.0	32	41.6	0 682; 0.409
Abnormal heart rate (<120 or >160/ml	9	26.5	13	16.9	1.364; 0.243
Hypoglycaemia	12/26	46.2	29/72	40.3	0.271;0.603
Metabolic acidosis	16/22	72.7	39/72	54.2	2.391; 0.122
Elevated blood urea nitrogen	13/23	56.5	31/73	42.5	1.392; 0.238
PCV <40%	15/24	62.5	23/72	31.9	2.126; 0.008*
Hypocalcaemia	6/9	66.7	23/27	85.2	1.478; 0.224
Inter-current illnesses	14	41.2	25	32.5	0.785; 0.376

**Statistically significant*

Table V

Multiple Regressions of Risk Factors for Mortality

Parameters	*Coefficient*	*95% confidence limits*		*t*	*P*
		lower	*upper*		
Age > 24h	-0.154	-0.307	0.051	-1.512	0.129
Delivery outside OOUTH	0.220	0.009	0.398	2.076	0.041*
Delivery by C/S	-0.079	-0.249	0.092	-.905	0.368
EGA < 37 weeks	0.337	0.160	0.541	3.654	0.000*
Hypothermia	0.016	-0.161	0.196	0.174	0.862
Coma on admission	0.327	0.117	0.531	3.109	0.002*
Seizures	-0.067	-0.289	0.150	-0.628	0.531
Hypoglycaemia	0.039	-0.135	0.198	0.445	0.657
Metabolic acidosis	0.022	-0.190	0.232	0.182	0.723
Hypocalcaemia	0.027	-0.222	0.104	0.194	0.716
Azotaemia	0.077	-0.146	0.289	0.616	0.542
PCV <40%	0.227	0.054	0.375	2.647	0.009*
Intercurrent illness	0.085	-0.087	0.249	0.957	0.341

* *Standardised co-efficient (beta); *Statistically significant. EGA – Estimated gestational age*

two-fold increase in mortality risk (52 percent vs 21.8 percent; RR = 2.38; 95% CI – 1.36 – 4.20).

Comparison of clinical parameters of the fatalities with those of survivors revealed that significantly higher proportions of the fatalities presented with prematurity, low birth weight, altered sensorium, abnormal cry and cyanosis as shown in Table IV. Conversely, the percentage of babies delivered at OOUTH was significantly lower among the fatalities. Multiple linear regression analysis showed further that prematurity, delivery outside OOUTH, coma on admission and concurrent anaemia were positive predictors of mortality with Beta-coefficient of regression values of 0.337 (p=0.000), 0.220 (p = 0.041) 0.327 (p = 0.002) and 0.227 (p = 0.009), respectively. On the other hand, factors like late presentation (beyond 24 hours after birth), lack of antenatal care, maternal primiparity, hypothermia and respiratory distress did not have significant predictive value on the outcome. Similarly, presence of hypoglycaemia, metabolic acidosis, hypocalcaemia or seizures at presentation did not show significant correlation with mortality (Table V).

Discussion

About one quarter of all neonatal admissions in the present study were as a result of birth asphyxia, thus indicating that the condition is a common health problem of the newborn in Nigeria. This is in agreement with earlier reports,[7,9] and the general view that the incidence of birth asphyxia is still very high in developing countries.[10] Whereas there has been a significant reduction in the incidence of birth asphyxia in most industrialised countries following improvements in primary and obstetric care,[11] there has not been any remarkable change in the situation

in many developing countries. Many reasons have been adduced for this. In the first instance, it has been noted that birth rates are high and perinatal resources are limited.[12] Furthermore, many women do not receive adequate care during pregnancy, labour and delivery.[1] This is buttressed by the observation that more than twenty five percent of the mothers of our patients were unbooked and did not receive any form of antenatal care. There is a need therefore to enlighten all women of child-bearing age on the importance of early registration for antenatal care and regular clinic attendance whenever they become pregnant.

Target organs of perinatal asphyxia are the brain, heart, lungs, kidneys, liver, bowel, and bone marrow but hypoxic-ischemic brain injury has been recognised as one of the most important consequences of this condition.[13] Thus our finding of neurological dysfunction as the most common mode of presentation of a large number of asphyxiated babies in this study is in keeping with this view. This also underscores the vulnerability of the brain to the effect of hypoxia.

Up to 40 percent of our subjects developed birth asphyxia after a supposedly normal delivery. This supports the position that the need for resuscitation often comes as a complete surprise.[14] Anticipation is therefore essential and adequate preparation should be made ahead of time for the resuscitation of the newborn during the delivery of all pregnant women. For the same reason, every birth should be attended by at least one person skilled in neonatal resuscitation whose sole responsibility would be management of the newborn. Additional personnel will be needed if more complex resuscitation is anticipated.[14] Meeting this demand in most developing countries will require a comprehensive plan for across-the-board training of birth attendants, including the TBAs, on the basic technique of neonatal resuscitation, and deployment of more health workers to improve the staffing of peripheral hospitals and maternity centres.

Birth asphyxia has been associated with high mortality among neonates especially in developing countries of the world.[15] It has been reported by previous workers as ranking high among the leading causes of neonatal mortality.[3,4,15,16] This is buttressed by a case fatality rate of about thirty percent observed in the present study. Furthermore, the risk of dying was significantly higher for outborn babies in line with an earlier report.[9] Possible explanation for this includes poor or incomplete resuscitation and stabilisation of such babies before referral, the stress of travelling over long distances without adequate medical support from the place of birth to the hospital, and delay in post-resuscitation management. All these may worsen the extent of neuronal damage in asphyxiated babies and thus increase the risk of death. One way of minimising the problem is to ensure that high-risk pregnancies are referred early to specialised centres for delivery.

Another prominent risk factor for mortality in our study population was prematurity. This is presumed to be due to the fact that the preterm infant is ill-equipped to cope with the stress of hypoxia owing to the immaturity of homeostatic mechanisms and general lack of substrate stores. The finding is in agreement with an earlier report.[9] Therefore, efforts aimed at the reduction of neonatal deaths from birth asphyxia must include measures that are capable of reducing the overall incidence of prematurity. In this regard, the importance of quality antenatal care for all pregnant women cannot be overemphasised. Deep coma at presentation constitutes a risk factor for mortality in birth asphyxia for obvious reasons. As a sign of severe neuronal dysfunction, it is indicative of extensive hypoxic-ischaemic injury to the brain possibly associated with widespread necrosis and infarction in some of the infants. It is therefore very important that resuscitation of an asphyxiated baby should be commenced immediately after birth by skilled personnel to prevent extensive and irreversible neuronal damage.

Another major finding of note is the observation that low haematocrit level has a positive predictive value for mortality in birth asphyxia. This finding is potentially amenable to intervention through red cell transfusion. Thus, all asphyxiated babies should be promptly investigated for anaemia and those with a haematocrit that is less than forty percent should be treated with red cell transfusion as a matter of urgency. Contrary to expectation, late presentation did not show significant correlation with mortality in this study. It is thought that babies who presented late probably suffered milder hypoxic injury, and as such did not manifest noticeable abnormal signs until after the first day of life, and for the same reason, did not develop fatal complications of birth asphyxia.

Conclusion

It is concluded that mortality from birth asphyxia is still high in our environment and the risk factors include prematurity, anaemia and severe hypoxic-ischaemic encephalopathy. It is recommended that neonatal resuscitation must be immediate and adequate while post-resuscitation management plan should include prompt correction of anaemia with red cell transfusion.

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