Original Article

Prevalence, Risk Factors and Outcomes of Perinatal Asphyxia in Newborns at Benue State University Teaching Hospital Makurdi

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ABSTRACT

Perinatal asphyxia is a global neonatal problem, which significantly contributes to both neonatal morbidity and mortality. This study was therefore undertaken to determine the prevalence, risk factors and outcomes of perinatal asphyxia in Makurdi, Nigeria. A retrospective review of clinical data of all newborns managed at the Special Care Baby Unit of the Benue State University Teaching Hospital over a 5 year period (January 2015-December 2019) was carried out using the research clinical data form. Maternal information including biodata, obstetric history, perinatal events as well as neonates' presentation and outcomes were reviewed. All inborn neonates with Apgar scores <7 at 5 min or out-born neonates with no recorded Apgar scores but with history of poor cry/inability to cry at birth were classified as asphyxiated. Out of the 1142 neonates admitted during the study period, 127 neonates had perinatal asphyxia with prevalence of 11.1%. Eighty-four (66.1%) of the newborns were males, while 43(33.9%) were females with male to female ratio of 1.95:1 Majority of the newborns(89.1%) were managed and discharged without early neurologic complications; eight survived with early neurologic complications, eight were discharged against medical advice, while 7 newborns died, giving a case fatality rate of 5.5%.Risk factors significantly associated were Meconium-stained amniotic fluid(P=0.002) ,fetal presentation (P=0.030),and birth attendants (P=0.001). The burden of perinatal asphyxia still persists in our environment. Associated factors in this study were meconium stained liquor, and unskilled birth attendants. Hence pregnant women should be encouraged to attend antenatal care and should ensure skilled birth attendants attend delivery with capacity to conduct safe delivery and institute neonatal resuscitation when necessary.

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INTRODUCTION

Asphyxia is defined as the marked impairment of gas exchange leading if prolonged, to progressive hypoxemia, hypercapnia and significant metabolic acidosis.¹ Birth asphyxia is a major cause of neonatal morbidity and mortality and has been associated with neonatal death and several other complications including cerebral palsy.²⁻⁴ Globally, 2.9 million newborn babies die annually accounting for 44% of deaths in children younger than 5 years of age while another 2.6 million babies are stillborn every year, almost half of which occur during labor.⁵ Globally, intrapartum related conditions (perinatal asphyxia) is the second main cause of neonatal mortality causing 0.66 million (23%) deaths.⁵ More than 75% of these newborn deaths occur in south Asia and sub-Saharan Africa with Nigeria having the second highest neonatal death numbers after India.⁵ The incidence of birth asphyxia has reduced significantly following improvements in primary and obstetric care in most industrialized countries and accounts for less than 0.1% of newborn infant deaths.⁶ In developing countries, rates of birth asphyxia are much higher, ranging from 4.6/1000 in Cape Town to 7–26/1000 in Nigeria and case fatality rates may be 40% or higher.⁶ Several reports have continued to identify birth asphyxia as a major cause of neonatal deaths in Nigeria.⁷⁻⁹ These rates of birth asphyxia which contributes majorly to neonatal deaths are not acceptable if Nigeria will achieve the SDG 3.2 goal of reducing neonatal mortality to <12 per 1000 live births by the year 2030.¹⁰ There is therefore need for concerted efforts to reduce the burden of birth asphyxia at all levels. Hence this study aimed to determine the prevalence, risk factors and outcomes of birth asphyxia at the Benue State University Teaching Hospital, Makurdi, Nigeria.

MATERIALS AND METHODS

This was a 5 year (January 2015- December 2019) retrospective study carried out at the Special Care Baby

Unit of the Benue State University Teaching Hospital. The Benue State University Teaching Hospital is a tertiary center located in Makurdi, which is the state capital of Benue State. The hospital provides specialist care to the inhabitants of the state capital and the state at large. It has a department of pediatrics that is manned by specialist doctors as well as trained nurses who attend to newborns delivered in the facility as well as those referred from other facilities. The unit is supervised by a Consultant neonatologist and has resident doctors providing services while undergoing clinic rotation in the unit. The special care baby unit caters to the needs of newborns delivered in the facility who get admitted into the In-born section as well as the needs of newborns referred from other facilities. The special care baby unit is manned by a trained neonatologist, specialist registrars, and trained nurses. All neonates admitted into the special care baby unit within the study period with the diagnosis of perinatal asphyxia were recruited, while all stillbirths were excluded. Perinatal asphyxia was defined as 5 minute Apgar score <7,¹¹⁻¹² plus presence of neonatal encephalopathy and multi-organ dysfunction,³ as well as need for resuscitation or if baby did not cry at birth.¹³ The severity of perinatal asphyxia was classified as mild if the Apgar score was 6 or a history that the baby required only suctioning/stimulation to establish a strong cry. Moderate perinatal asphyxia was defined as Apgar score of 4–5, or a history that the baby required stimulation and oxygen administration before a strong cry. A score of 0–3 or a history that the baby required major intervention such as Ambu-bagging, or presented with convulsion, loss of consciousness, central cyanosis, or floppiness was defined as severe birth asphyxia. Data was collected from patient's records using a clinical data form with provisions for maternal biodata, maternal obstetric history, labor history, mode of delivery, gestation and sex of baby, Apgar score at birth, history of poor cry at birth, interventions done after delivery, physical examination findings at

presentation and duration of hospital stay. Ethical approval was obtained from the Benue State University Teaching Hospital Health Research Ethics committee.

Data was analyzed using IBM SPSS Statistics for Windows, version 23, Armonk. NY:IBM Corp and presented as tables. Bivariate analysis was carried out to determine significant risk factors with a P value of <0.05 considered statistically significant.

RESULTS

Table 1: Maternal Socio-Demographic Characteristics (N=127)

Variables	Frequency	Percent
Maternal age (in years)		
15-20	14	11.0
21-25	37	29.1
26-30	47	37.0
31-35	19	15.0
>35	10	7.9
Mean=27.54±5.80		
Parity		
1	57	44.9
2	29	22.8
3	15	11.8
4	26	20.5
Mean=2.35±1.78		
Level of education		
No formal education	47	37.0
Primary	9	7.1
Secondary	28	22.0
Tertiary	43	33.9
ANC status		
Booked	108	85.0
Un-booked	19	15.0
Maternal health Condition		
No illness	101	79.5
Eclampsia	9	7.1
Ante partum bleeding	3	2.4
Cardiac disease	3	2.4
RVD	9	7.1
Hepatitis B	2	1.6
Mode of delivery		
Spontaneous Vaginal	86	67.7
Cesarean section	41	32.3
Duration of membranes rupture (in hours) (N=30)		
1-10	13	43.3
11-20	5	16.7
21-30	6	20.0
>30	6	20.0

Table 1 shows maternal socio-demographic characteristics. Majority of the mothers (37.0%) were between ages 26-30 years, followed by those aged 21-25 years (29.1%) and the least were those above 35 years. The mean age of mothers was 27.54±5.80 years. Majority of the mothers (44.9%) were para 1, followed by para 2 (22.8%) and the least were para3 (11.8%) . The mean parity was 2.35±1.78 More than one-third, (37.0%) had no formal education, followed by those with tertiary education (33.9%) and the least was those with primary education (7.1%). Most of the mothers (85.0%) booked for ANC and majority of the mothers (79.5%) had no maternal illness during pregnancy. Two-thirds, (67.7%) had vaginal delivery, while one-third (32.3%) had delivery via caesarean section.

Table 2: Maternal Obstetric Characteristics (N=127)

Variables	Frequency	Percent
Meconium-stained amniotic fluid (MSAF)		
Yes	29	22.8
No	98	77.2
Type of labor (N=82)		
Spontaneous	74	90.2
Induced	8	9.8
Duration of labor (in hours) (N=75)		
1-10	28	37.3
11-20	29	38.7
21-30	13	17.3
>30	5	6.7
Fetal presentation		
Cephalic	71	86.6
Breech	11	13.4
Complication of labor (N=55)		
Obstructed	13	23.6
Not obstructed	42	76.4
Birth attendant		
Skilled	114	89.8
Unskilled	13	10.2
Gestational age (in weeks)		
31-35	35	27.6
36-40	70	55.1
>40	22	17.3
Mean=37.30±3.17		

Table 2 shows maternal obstetric characteristics. Majority of mothers (77.2%) had no meconium stained amniotic fluid. Concerning type of labor, majority of the mothers (90.2%) had spontaneous labor, while 9.8% were induced. A slightly higher proportion, (38.7%) took 11-20 hours to delivery. Majority of the mothers (86.6%) had cephalic presentation, while 13.4% had breech presentation. Majority of the mothers (76.4%) did not experience obstructed labor, while only 23.6% experienced obstructed labor. Majority of the mothers (89.8%) were attended to by skilled birth attendants during delivery, while 10.2% had delivery supervised by unskilled attendants.. Over half of the mothers, (55.1%) delivered at gestational ages between 36-40 weeks with an overall mean gestational age of 37.30 ± 3.17 week.

Majority of the neonates (86.6%) were aged 1-2 days at presentation while the least (7.1%) were five days and above, with the median age at presentation being 1 day. Two-third, (66.1%) of the neonates were males, while one-third, (33.9%) were females; giving a male: female ratio of 1.95:1. The mean birth weight was 2.92 ± 0.62 kg with a higher proportion of the babies (76.4%) weighing between 2.5-4.0 kg. Most of the babies (43.3%) had No Apgar scores, while (2.4%) had Apgar scores of 0-3, (12.6%) had Apgar scores 4-5, (11.8%) had Apgar score of 6, while 38(29.9%) had Apgar score 7. The predominant presentation (39.2%) among the newborns was inability to cry, followed by convulsion (15.3%) , then inability to suck(13.4%) and the least were jaundice and prematurity (1.4%) respectively. Most babies (47.2%) had Sarnat & Sarnat hypoxic ischemic encephalopathy (HIE) stage 2, followed by (44.9%) who had HIE 1 and the least was (7.9%) with HIE 3. Table 3

Table 4 shows treatment outcomes. Majority of the neonates (40.9%) stayed on admission for a period of 6-10 days, followed by those who stayed for 11-15 days (23.6%) and the least were those who spent more than 20 days on admission (9.4%), with the mean duration

of hospital stay as 11.31 ± 6.32 days. Majority of the neonates (81.9%) were managed and discharged with no neurologic complication followed by those who were discharged with neurologic complication (6.3%) and those who were discharged against medical advice(6.3%) and the least were those who died (5.5%). Table 5 above shows the correlation between birth asphyxia and associated risk factors. Following bivariate analysis, Meconium-stained amniotic fluid ($P=0.006$), and birth attendants ($P=0.001$) were found to be statistically significant.

Table 3: Neonates' characteristics (N=127)

Variables	Frequency	Percent
Age at presentation (in days)		
1-2	110	86.6
3-4	8	6.3
5	9	7.1
Median=1.00		
Sex		
Male	84	66.1
Female	43	33.9
Birth weight (in kg)		
<2.5	28	22.0
2.5-4.0	97	76.4
>4.0	2	1.6
Mean=2.92±0.62		
APGAR Scores At 5 minutes		
No APGAR Scores	55	43.3
0-3	3	2.4
4-5	16	12.6
6	15	11.8
7	38	29.9
Presenting Complaint (Multiple response)		
Low/poor APGAR scores	19	9.1
Fever	18	8.6
Inability to cry	82	39.2
Difficulty in breathing	16	7.7
Inability/poor suck	28	13.4
Convulsion	32	15.3
Prematurity	3	1.4
Jaundice	3	1.4
Others*	8	3.8
Sarnat Staging of PNA		
HIE 1	57	44.9
HIE 2	60	47.2
HIE 3	10	7.9
HIE-hypoxic ischemic encephalopathy		

Table 4: Treatment Outcomes (N=127)

Variables	Frequency	Percent
Duration of stay (days)		
1-5	16	12.6
6-10	52	40.9
11-15	30	23.6
16-20	17	13.4
>20	12	9.4
Mean=11.31±6.32		
Treatment Outcomes		
Discharged with no complication	104	81.9
Discharge with neurologic complication	8	6.3
Died	7	5.5
DAMA	8	6.3

Table 5: Association between risk factors of birth asphyxia and APGAR scores

Variables	No AS N= n(%)	0-3 N= n(%)	4-5 N= n(%)	6 N= n(%)	7 N= n(%)	p-value
Maternal age (in years)						0.314
15-20	3(21.4)	1(7.1)	4(28.6)	3(21.4)	3(21.4)	
21-25	22(59.5)	0(0.0)	2(5.4)	3(8.1)	10(27.0)	
26-30	17(36.2)	1(2.1)	6(12.8)	7(14.9)	16(34.0)	
31-35	9(47.4)	1(5.3)	2(10.5)	2(10.5)	5(26.3)	
>35	4(40.0)	0(0.0)	2(20.0)	0(0.0)	4(40.0)	
ANC status						0.920
Booked	48(44.4)	3(2.8)	13(12.0)	13(12.0)	31(28.7)	
Unbooked	7(36.8)	0(0.0)	3(15.8)	2(10.5)	7(36.8)	
Maternal health Condition						0.596
No illness	46(45.5)	3(3.0)	13(12.9)	12(11.9)	27(26.7)	
Eclampsia	2(22.2)	0(0.0)	1(11.1)	3(33.3)	3(33.3)	
Ante partum bleeding	2(66.7)	0(0.0)	1(33.3)	0(0.0)	0(0.0)	
Cardiac disease	2(66.7)	0(0.0)	0(0.0)	0(0.0)	1(33.3)	
RVD	2(22.2)	0(0.0)	1(11.1)	0(0.0)	6(66.7)	
Hepatitis B	1(50.0)	0(0.0)	0(0.0)	0(0.0)	1(50.0)	
Mode of delivery						0.446
Spontaneous Vaginal	33(38.4)	3(3.5)	12(14.0)	12(14.0)	26(30.2)	
Cesarean section	22(53.7)	0(0.0)	4(9.8)	3(7.3)	12(29.3)	
Meconium-stained amniotic fluid MSAF						0.006*
Yes	6(20.7)	2(6.9)	3(10.3)	3(10.3)	15(51.7)	
No	49(50.0)	1(1.0)	13(13.3)	12(12.2)	23(23.5)	
Duration of labor (in hours) (N=75)						0.058
1-10	14(50.0)	0(0.0)	0(0.0)	7(25.0)	7(25.0)	
11-20	15(51.7)	0(0.0)	5(17.2)	1(3.4)	8(27.6)	
21-30	6(46.2)	0(0.0)	4(30.8)	1(7.7)	2(15.4)	
>30	3(60.0)	0(0.0)	0(0.0)	0(0.0)	2(40.0)	
Fetal presentation						0.033
Cephalic	41(57.7)	0(0.0)	6(8.5)	9(12.7)	15(21.1)	
Breech	2(18.2)	0(0.0)	3(27.3)	2(18.2)	4(36.4)	
Complication of labor (N=55)						0.148
Obstructed	3(23.1)	1(7.7)	3(23.1)	2(15.4)	4(30.8)	
Not obstructed	21(50.0)	0(0.0)	4(9.5)	5(11.9)	12(28.6)	
Birth attendant						0.001*
Skilled	42(36.8)	3(2.6)	16(14.0)	15(13.2)	38(33.3)	
Unskilled	13(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Gestational age (in weeks)						0.065
31-35	16(45.7)	1(2.9)	5(14.3)	5(14.3)	8(22.9)	
36-40	36(51.4)	2(2.9)	7(10.0)	6(8.6)	19(27.1)	
>40	3(13.6)	0(0.0)	4(18.2)	4(18.2)	11(50.0)	

* = Statistically Significant

DISCUSSION

Perinatal asphyxia still remains a global phenomenon and it causes significant neonatal morbidity and mortality with higher incidence reported in developing countries. The prevalence of perinatal asphyxia in this study was found to be 11.1%. This was lower than the reported prevalence rate of 30% by Ilah *et al*¹⁴ in Gusau, West and Opara⁷ in Port-Harcourt as well as the 24.7% reported by Aliyu *et al*,⁹ in Birnin Kebbi. However, this prevalence rate is higher than the reported 4.6% from cape town in South-Africa.⁶ The lower prevalence could be due to the time of the study which may account for the improved obstetric care compared with the previous reports with higher prevalence since both studies were facility based. Moreover, the higher prevalence in the far North could also be from the cultural practices; such as poor antenatal care, home delivery by unskilled attendants, inability of women to access hospital care without the husbands' permission etc. The study prevalence however is similar to the prevalence of 15.9% reported from a meta-analysis and review undertaken in East and Central Africa.¹⁵ Most mothers who delivered babies with birth asphyxia in this study booked for ANC, majority of the mothers had no maternal illness during pregnancy and they delivered via spontaneous vaginal delivery. This was in contrast with the report of West and Opara⁷, in Port-Harcourt whose study reported that 39.5% of mothers did not receive ante-natal care, 90% of the mothers in their study had complications during pregnancy and more than half delivered via caesarean section. Ilah *et al*¹⁴ in Gusau also reported lack of ANC care amongst mothers who delivered babies with asphyxia mostly via caesarean section unlike in our study where most mothers delivered via SVD. The duration of labor is a known risk factor for perinatal asphyxia and in this study we found that moderate asphyxia was prevalent among mothers whose labor lasted for about 21-30 hours. This finding is similar to the report of Ugwu *et al*¹⁶ in Warri, Ilah *et al*¹⁴ in Gusau who also documented prolonged labor as the commonest cause of

asphyxia. Prolonged labor will lead to birth asphyxia if there is delayed intervention and this is in congruence with the finding of severe asphyxia in babies whose mothers had meconium stained amniotic fluid. A fetus may pass meconium in utero as a result of prolonged labour and fetal distress. Fetal mal-presentation has been documented to be a risk factor related to perinatal asphyxia, as mal-presentation could lead to obstructed labor, which is associated with perinatal asphyxia. We found that moderate asphyxia was prevalent among babies with breech presentation which is similar to the report of Ugwu *et al*.¹⁶ Interestingly most of the neonates that had moderate asphyxia were delivered by skilled birth attendants. This however could be as a result of prolonged labor, mal-presentation as well as obstructed labor as moderate asphyxia was also prevalent among mothers with obstructed labor. This however underlines the need for training and re-training of birth attendants on neonatal resuscitation in keeping with international recommendations.

The outcomes in this study were good as majority (81.9%) of the neonates were managed and discharged home without neurologic complications with a case fatality rate of 5.5%. This could be due to the fact that very few neonates among those who had Apgar scores, had scores between 0-3 at the 5th minute and few were also classified as having HIE 3 which has the worst outcomes. This is similar to the report of Ugwu *et al*¹⁶ who also documented more cases of mild asphyxia in their report, as well as Aliyu *et al*⁹ who documented 87.4% discharges. This is in contrast with other studies in Nigeria with reported higher case fatalities such as Egharevba *et al*,¹⁷ which reported a mortality rate of 31.1%, West and Opara⁷ which reported a case fatality of 16.6% and Ilah *et al*¹⁴ (25.5%). The low number of early neurologic complications does not exclude the possibility of neurologic sequelae that may develop over long time of follow up. Every effort should therefore be made to reduce the incidence of perinatal asphyxia in our community, this include education on

antenatal care, delivery by skilled birth attendants, and training and retraining on newborn resuscitation.

CONCLUSION

The burden of perinatal asphyxia still persists in our environment with its attendant consequences which leaves behind a lifetime disability. Significant associated factors in this study were meconium stained liquor, and unskilled birth attendants. There is therefore need for retraining of skilled birth attendants within our environment in accordance with international standards for more effective neonatal resuscitation

Limitation

This study was facility based and hence could not capture all babies delivered at home who were not brought to the hospital. Secondly, the use of Apgar scores or history of poor cry/inability to cry at birth does not correlate completely with perinatal asphyxia. A more precise definition of perinatal asphyxia would have included the use of blood gas analysis, which was not available in our environment.

Conflict of interest

No conflict of interest declared.

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