Original Research Article

COMMON CAUSES OF NEONATAL DEATH IN CALABAR, SOUTH-SOUTH NIGERIA: AN AUTOPSY STUDY

Abstract

Background: Neonatal deaths are deaths of live born babies occurring before 28 completed days. The vast majority occur in low-income countries like Nigeria with a high neonatal mortality rate. There is paucity of autopsy studies due to refusal of family to give consent for such procedures.

Aim: To identify the commonest causes of neonatal death in 53 neonatal autopsies in Calabar, Nigeria.

Material and Methods: Detailed postmortem was carried out using lettules techniques and bits taken for histological analysis to ascertain the cause of death. Other relevant contributory factors such as the gestational age, mode of delivery, place of birth, antemortem cause of deaths and maternal obstetric history were obtained from the medical records and autopsy request forms

Results: In the one-year retrospective study of 53 neonatal autopsies, male: female ratio was 1: 0.83 and mean age at death was 6.5 + 7.3 days, ranging from 1 to 28 days. The commonest cause of neonatal death was severe birth asphyxia seen in 10 cases (18.9%), followed by kernicterus in 6 cases (11.3%), birth trauma seen in 6 cases (11.3%), congenital heart disease seen in 5 cases (9.4%), and prematurity seen in 5 cases (9.4%).

Conclusion: The study confirms the usefulness of neonatal autopsy in ascertaining the definitive cause of death. Severe birth Asphyxia was identified as the commonest cause of death in the neonatal period followed by birth trauma, kernicterus and congenital heart diseases.

Key Words: Neonatal Death, Neonatal Autopsy, Cause of Death, Severe birth Asphyxia

1. Introduction

Neonatal period is defined as the time between birth and 28days of life. It is a highly vulnerable period of life when a neonate may develop certain serious problems which may lead to death (1). Early neonatal deaths are deaths of live born babies during the first seven completed days after birth, and late neonatal deaths occur after 7 completed days and before 28 completed days (1). The vast majority of neonatal deaths occur in the low-income countries where standards of both maternal and newborn care are low and of the approximately 130 million infants born worldwide each year, it is estimated that four million infants die during the first month of life(2–4). Children who die within the first 28 days of birth suffer from conditions and diseases associated with lack of quality care at birth or skilled care and treatment immediately after birth and in the first days of life. Nigeria as of 2019 fall within the first 10 countries with the highest number of newborn deaths (5–7). The first step in improving early neonatal survival is to identify the common causes and look for modifiable factors and develop policies such as quality neonatal care that is easily available and affordable to the common man within the geopolitical zone. Empowerment and

training of community health workers and traditional birth attendants at the community level will help in the reduction of maternal and neonatal mortality. However, few developing countries have vital registration systems that are complete enough to provide accurate estimates of neonatal mortality, or of its early and late components (8–10)

2. Materials and Method

A retrospective study of 53 neonatal autopsies conducted in the Department of Pathology, University of Calabar Teaching Hospital within a period of a year. Detailed postmortem was carried out using lettules techniques and bits taken for histological analysis to ascertain the cause of death. Other relevant contributory factors such as the gestational age, mode of delivery, place of birth, antemortem cause of deaths and maternal obstetric history were obtained from the medical records and autopsy request forms. The data obtained was transferred into SPSS version 21.0 and statistical analysis carried out.

3. Results

In the one-year retrospective study of 53 neonatal autopsies, male : female ratio was 1: 0.83 and mean age at death was 6.5 + 7.3 days, ranging from 1 to 28 days, with a little less than one-fifth (10) i.e. 18.9% dying within 24 hours and one-half (26) i.e. 49.1%, dying within 2-7 days of life, respectively. The commonest cause of neonatal death was severe birth asphyxia seen in 10 cases (18.9%), followed by kernicterus in 6 cases (11.3%), birth trauma seen in 6 cases (11.3%), congenital heart disease seen in 5 cases (9.4%), and prematurity seen in 5 cases (9.4%). As shown in table 7 below. Table 1 presents the sociodemographic data of the mothers, antenatal care, fetal presentation and the places of delivery. The type of labour, mode of delivery and clinical presentations are presented in table 2. Clinical diagnosis, wards and length of stay are presented in table 3. Findings from the skin, scalp, and brain are presented in table 4. That cardiac and lungs findings are presented in table 5. Findings from the liver, spleen, GIT, adrenal gland, and the urinary system are presented in table 6.

Table 1: Sociodemographic variables

Variable	Frequency	Percentage
Maternal Age Group		
16-20 years	8	15.1
21-25 years	13	24.5
26-30 years	17	32.1
31-35 years	12	22.6
36-40 years	2	3.8
41-45 years	1	1.9
Maternal Educational Level		
Primary	8	15.1
Secondary	32	60.4
Tertiary	11	20.8

No formal Education	2	3.8
Others	0	0.0
Antenatal Care		
UCTH	21	39.6
General Hosp	9	17.0
Private Hosp	4	7.5
Other Hosp	2	3.8
Unbooked	17	32.1
Foetal Presentation		
Cephalic	48	90.6
Breech	3	5.7
Transverse	2	3.8
Others	0	0.0
Place of Delivery		
UCTH	26	49.1
General Hosp	9	17.0
Private Hosp	3	5.7
Other Hosp	2	3.8
Traditional Birth Facility	4	7.5
Church	4	7.5
Home	5	9.4
Other	0	0.0

Table 2: Showing type of labour, mode of delivery and clinical presentations

Variable	Frequency	Percentage
Labour		
Spontaneous	30	56.6
Induced	16	30.2
Others	7	13.2
Labour Progress		
Normal	16	30.2
Prolonged	32	60.4
Others	5	9.4

History of Foetal Distress		
Yes	38	73.1
No	14	26.9
Liquor Colour		
Colourless	30	56.6
Meconium-stained	22	41.5
Others	1	1.9
Mode of Delivery		
SVD(Normal)	40	75.5
Forceps Delivery	0	0.0
Caesarean Section	11	20.8
Breech	2	3.8
Others	0	0.0
Gender		
Male	29	54.7
Female	24	45.3
Clinical presentation		
Low birth weight	2	3.8
prematurity	13	24.5
postdate	11	20.8
cord around neck	2	3.8
true knot	0	0.0
jaundice	3	5.7
spasms	2	3.8
Fever	3	5.7
Fast breathing	5	9.4
convulsion	0	0.0
poor cry	5	9.4
Abdominal mass	1	1.9
poor suck	4	7.5
ruptured omphalocoele	1	1.9
cellulitis	1	1.9

Table 3: Showing clinical diagnosis, wards and length of stay

Variable	Frequency	Percentage
Clinical Diagnosis		
Severe Birth Asphyxia	22	41.5
Acute Respiratory Distress Syndr	1	1.9
Prematurity	6	11.3
Neonatal Sepsis	9	17.0
Neonatal Jaundice (Kernicterus)	3	5.7
Neonatal Tetanus	3	5.7
Meconium Aspiration	1	1.9
Congenital Heart Disease	3	5.7
Congenital Pneumonia	3	5.7
Congestive Cardiac Failure	1	1.9
Posterior Urethral Valve	1	1.9
Lung Collapse	0	0.0
Ward		
Sick Baby Unit (SBU)	35	66.0
Special Care Baby Unit (SCBU)	14	26.4
Labour Ward	4	7.5
Others	0	0.0
Age Group		
1-7 days	36	67.9
8-14 days	11	20.8
15-21 days	2	3.8
22-28 days	4	7.5
Length of Stay		
1-7 days	43	81.1
8-14 days	4	7.5
15-21 days	2	3.8
22-28 days	4	7.5

Table 4: Showing the findings from the skin, scalp, and brain

Variable	Frequency	Percentage
Skin Findings		
Cellulitis	2	3.8
Lividity	24	45.3
Jaundice	10	18.9
Meconium staining	11	20.8
Haemangiomas	0	0.0
cafe au lait spots	0	0.0
Pustules	0	0.0
scaly lesions	0	0.0
petechiae haemorrhage	6	11.3
Scalp Findings		
Subgaleal hemorrhage	3	5.7
Cephalhaematoma	30	56.6
Laceration	4	7.5
puncture needle wounds	12	22.6
caput succedenum	4	7.5
Brain Findings		
Epidural haemorrhage	2	3.8
Subdural haemorrhage	0	0.0
Subarachnoid haemorrhage	4	7.5
Intraventricular haemorrhage	1	1.9
Intraparenchymal haemorrhage	0	0.0
Meningitis	0	0.0
Kernecterus	6	11.3
Tonsilar herniation	3	5.7
cerebral oedema	19	35.8
cerebral congestion	18	34.0
staining of basal ganglia and ventricles	0	0.0

Table 5: Showing the cardiac and lungs findings

Variable	Frequency	Percentage
Cardiac Findings		
Cardiomegaly	14	26.4
Univentricular heart	1	1.9
ASD	11	20.8
VSD	3	5.7
PDA	0	0.0
TOF	0	0.0
TGA	1	1.9
Left ventricular hypertrophy	3	5.7
Flabby Heart	13	24.5
Haemopericardium	1	1.9
No obvious pathology	6	11.3
Findings in the Lungs		
Hypoplasia of lungs	0	0.0
Bronchial mucosa plug	0	0.0
Consolidation	20	37.7
Pulmonary haemorrhage	5	9.4
Meconium aspiration	1	1.9
Pulmonary embolus	0	0.0
Hyperinflated lungs	0	0.0
Severe venous congestion	8	15.1
Pulmonary edema	17	32.1
Pneumonia	2	3.8

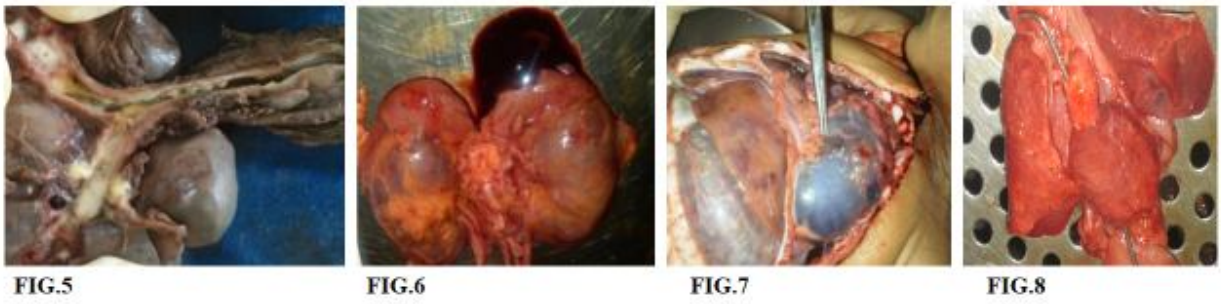
Table 6: showing findings from the liver, spleen, GIT, adrenal gland, and the urinary system

Variable	Frequency	Percentage
Liver Findings		
Hepatomegaly	5	9.4
Hepatic cyst	1	1.9
Hemangioma	1	1.9
Chronic venous congestion	45	84.9
Viral hepatitis	0	0.0
Fatty Change	1	1.9
Spleen		
Splenomegaly	2	3.8
Malaria spleen	1	1.9
Splenitis	8	15.1
Diffluent spleen	5	9.4
chronic congestion	37	69.8
GIT Findings Malrotation	0	0.0
Omphalocoele	1	1.9
Imperforate anus	0	0.0
Necrotizing enterocolitis	1	1.9
gangrenous bowel	1	1.9
pneumatosis intestinalis	6	11.3
No Obvious pathology	44	83.0
Adrenal gland Adrenal haemorrhage	13	24.5
Adrenal hyperplasia	1	1.9
Adrenal hypoplasia	0	0.0
No obvious pathology	39	73.6
Urinary System Shocked kidneys	50	94.3
Renal cyst	1	1.9
Hydronephrosis	1	1.9
Megaureter	0	0.0
Posterior urethra valve	0	0.0

Horse shoe kidney	1	1.9

Table 7: showing the causes of death

Variable	Frequency	Percentage
Cause of Death		
ARDS	2	3.8
Pulmonary Haemorrhage	2	3.8
Bronchopneumonia	1	1.9
Congestive Cardiac Failure	1	1.9
Congenital Heart Disease	4	7.5
Kernicterus	6	11.3
Birth Trauma	6	11.3
Severe Birth Asphyxia	10	18.9
Aspiration Pneumonitis	1	1.9
Subtotal Lung Collapse	0	0.0
Neonatal Tetanus	1	1.9
Acute Renal Failure	0	0.0
Multicystic Kidney Disease	1	1.9
Prematurity	5	9.4
Major Non-cardiac Congenital Anomalies	0	0.0
Neonatal Sepsis	2	3.8
Posterior Urethral valve	1	1.9
Severe Anaemia	1	1.9
Necrotising Enterocolitis	1	1.9
Intracranial Haemorrhage	4	7.5
Meconium Aspiration Syndrome	3	5.7
Birth Trauma	0	0.0
Meningitis	1	1.9



Figures (1-8): Photographs showing some common causes of Neonatal death in the study.

Figure 1 (massive subgalel hematoma), Figure 2 (Subarachnoid hemorrhage), Figure 3&4 (Kernecterus), Figure 5 (Aspiration Pneumonitis), Figure 6 (Adrenal hemorrhages) and Figure 7 (Disseminated intravascular coagulopathy) and Figure 8 (Congenital Heart defects).

4. Discussion

The causes of death in the neonatal period in developing world are poorly measured, though major components are believed to be birth asphyxia, severe neonatal infections, complications of prematurity and neonatal tetanus (8,9,11–13). In this study of 53 neonatal autopsies, the commonest cause of neonatal death was also severe birth asphyxia (10, 18.9%), followed by kernicterus (6, 11.3%), birth trauma (6, 11.3%), congenital heart disease (5, 9.4%), prematurity (5, 9.4%), Neonatal sepsis and Bronchopneumonia (3, 5.7%) and Neonatal Tetanus (1,1.9%) (Table 1). These is in variance to earlier study carried in Calabar by Udoma and Udo in 2001 in which they reported that the major causes of morbidity were septicaemia in 35.9 percent, neonatal jaundice in 19 percent, tetanus in 13 percent and birth asphyxia in 10.9 percent. Their findings were based on antemortem findings rather than postmortem examination. Autopsy studies reveal that misdiagnosis is a relatively common occurrence, even where the diagnosis has been established by sophisticated modern investigative technologies (14). Foetal autopsy is able to provide a definite final diagnosis in 59% (122/206) of cases and this confirms the utility of foetal autopsy in identifying the cause of foetal loss, which will help in the genetic counseling of the couple (15). Asphyxia-specific early neonatal death is defined as death of foetus born at or after 35 completed weeks of gestation or weighing more than 2000g within first 7 days of life if asphyxia is assigned as primary cause of death by the attending neonatologist (16). Hospital based studies in Nepal and south Africa estimated that birth asphyxia accounted for 24% and 14% of perinatal mortality respectively (17,18). The incidence and mortality associated with severe birth asphyxia in Ilesha, Nigeria remained significantly high over a period of ten years

despite changes in social order. The incidence of severe birth asphyxia was 93.7/1000 admissions for the 1994 to 1998 period and 100.2/1000 admissions for the 1999 to 2003 period (19).

In Osogbo, Adebani et al, in 2010 reported that out of 59 babies with seizures, 37(62.7%) were considered to have had birth asphyxia. Babies with seizures and asphyxia had the highest risk of death 59.5% and 48.8% respectively (20). In Lagos, Ekure et al, in 2004 performed autopsy on 115 of the 573 perinatal deaths and reported that 38.7 percent were due to asphyxia conditions and 8.9 percent were attributed to conditions associated with immaturity (21). Mukhtar et al, 2007 reported that birth asphyxia accounted for the highest number of presentations at 27%, with sepsis at 25.3% and Prematurity at 16%. While findings of neonate dying from severe birth asphyxia were mainly intense venous congestion and cyanosis with pronounced lividity, Pulmonary congestion and oedema and Fluidity of the blood. These deliveries were conducted by untrained birth attendant at home and churches with late presentation at the University of Calabar Teaching Hospital, Calabar resulting in prolonged labour. Three out of five were un-booked and two booked in the general hospital Calabar. The two booked were offered caesarean section due to postdatism and contracted pelvis but declined. Their gestational age ranged from 40weeks to 43weeeks. Two out of the five neonates delivered through spontaneous vertex delivery were found dead the next day at the labour ward with massive cephal haematoma, pulmonary haemorrhage and haemoperioneum. Most deaths on the first day of live were the result of birth asphyxia, birth injury, or complications of preterm delivery. Birth asphyxia or injury (31%) and Preterm (26%) were the most common causes of death on day zero. On day 1 and during the first week of life, the proportion of deaths caused by birth asphyxia or injury was lower than on day 0(<14%) and on days 1-6, the frequent causes of death were preterm birth (30%) and sepsis or pneumonia (25%).

Birth trauma and kernicterus were the second commonest cause of neonatal death from our study (Fig. 3&4). The high cost of obstetric care, ignorance and unwholesome traditional belief by the uneducated and few educated women is an important factor leading to the patronage of traditional birth attendant that are mostly illiterate and without the basic skill in obstetric care (2). The resultant effect is poor obstetric outcome with babies presenting with Asphyxia due to prolonge obstetric care, massive cephahematoma as shown in (Fig. 1) and subarachnoid haemorrhages (Fig. 2). Although the federal ministry of health through health ministry and public health physician have taken initiative to educate and trained such high-risk women in the identification of birth challenges and the need for antenatal care with the aim of reducing neonatal mortality. The study revealed five cases of congenital heart disease, which were missed clinically misdiagnosed. None of the neonates had advanced imaging studies such as CT scan, MRI carried out to aid diagnosis due to unavailability of such investigations in our facility and cost implication. The commonest anatomical cardiac findings were large ASD, isolated large ventricular septa defect, univentricular heart chamber, pulmonary stenosis and transposition of the great arteries. The commonest isolated CHD in Nigeria is ventricular septal defect (VSD) which constitutes 27% of the cases followed by patent ductus arteriosus (PDA) 18%, atrial septal defect (ASD) (14.2%) and pulmonary stenosis (12.3%) 20 Congenital malformations of the heart are known leading causes of death in newborn was the third commonest cause of death in our study (Fig. 8).

Intracranial haemorrhage (Fig. 6) as a cause of death was clinically misdiagnosed as severe birth asphyxia (4, 100%). Autopsy findings in these categories of neonate showed diffuse subarachnoid haemorrhage, intraventricular haemorrhage into the falx cerebri and subdural haemorrhage to be the commonest type of intracranial haemorrhage seen and misdiagnosed in

these centres. None of the neonates dying from intracranial haemorrhage had advanced imaging study or simple skull x-ray carried out on presentation to aid ante mortem diagnosis. These could be attributed to the length of hospital stay, time at presentation, lack of advanced imaging studies (CT scan, MRI) and the high cost of such facility.

5. Conclusion

The study confirms the usefulness of neonatal autopsy in ascertaining the definitive cause of death. Severe birth Asphyxia was identified as the commonest cause of death in the neonatal period followed by birth trauma, kernicterus and congenital heart diseases. Traditional birth attendant plays a major role in the increase rate of neonatal mortality resulting from birth Asphyxia. Further training is strongly advocated for Traditional birth attendant as they appear to be the first point of care for our pregnant women.

Ethical approval

Ethical approval was obtained from UCTH Ethical Committee.

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