ORIGINAL REPORT

Determinants of Neonatal Mortality in a Private Tertiary Health Facility in the Niger Delta Region of Nigeria

Authors: Abolodje E.,[1*] Ozoalor . O,[2]

[1] Department of Paediatrics, Delta State University Teaching Hospital, Oghara

[2] Department of Paediatrics, Chevron Hospital, Warri

*Corresponding Author Email**:** efexabo@gmail.com
Tel + 2347037353893

Abstract

Background: Private tertiary health facilities in Nigeria are patronized mainly by those who can afford to pay for their services due to the high cost of medical care in these facilities. As a result the morbidity and mortality pattern may be unique.

Aim: The study was aimed at determining the neonatal morbidity and mortality pattern and the determinants of neonatal mortality in a private tertiary health facility in the Niger Delta region.

Methodology: The study was a review of all the cases admitted into the Neonatal Intensive Care Unit (NICU) in Lily hospital from 1st January to 31st December 2019. All cases were identified in the electronic data system of the hospital and data such as age, gestational age, sex, place of delivery, mode of delivery, diagnosis, treatment outcome were documented. The educational status and occupation of both parents were documented. Data was collected into an Excel Spreadsheet and analysis was with IBM SPSS for Windows 7, version 23.

Results: There were one hundred and eleven admissions into the NICU with 53 (47.7%) females and 58 (52.3%) males. Prematurity, neonatal jaundice and meconium aspiration syndromes were the commonest indications for admission. There were 13 (11.7%) deaths recorded during the period under review. However, prematurity, aspiration syndrome and NNS had the highest case fatality rate. Un-booked pregnancies (AOR =4.6; 95%CI= 0.8-26.7; p value =0.01) and delivery in a Primary Health Centre (AOR= 2.1; 95%CI =1.1-4.4; p = 0.04) were the most important predictors of neonatal mortality.

Conclusion: The commonest indications for admission into the NICU were prematurity, NNJ and meconium aspiration syndrome. Unsupervised pregnancy and delivery in a

Primary Health Care facility were the most important determinants of mortality

Keywords: Determinants, neonatal, mortality, private, tertiary

Introduction

Private tertiary health facilities in Nigeria are patronized mainly by those who can afford to pay for their services due to the high cost of medical care in these facilities.[1,2] Therefore the patients who seek medical care in these private facilities are likely to belong to the middle and upper social class of the society. In that wise, the neonatal morbidity and mortality pattern in such facilities may be different from what has been reported in the literature. Neonatal mortality has been shown to vary with socioeconomic characteristic such as wealth, maternal education, geographic zone and place of residence.[3,4] Hospital based surveys have shown that the three main causes of mortality among neonates in developing countries are prematurity, asphyxia and neonatal sepsis.[5-8] These findings were reported mainly in public health facilities where the people who patronize these institutions are a blend of the upper, middle and lower social class of the society. However, there are limited reports on neonatal morbidity and mortality pattern in private tertiary health facilities in Nigeria. Neonatal morbidity and mortality in private tertiary health facilities where the upper and middle class citizens patronize may be different from the findings from public health institutions reported in the literature. The neonatal mortality rates in private tertiary health facilities are likely to be lower and the morbidity pattern may be similar to findings reported in developed society. The aim of the study was to determine the neonatal morbidity and mortality pattern and the determinants of neonatal mortality in a private tertiary health facility in the Niger Delta region.

Methodology

Lily hospital is a private tertiary health facility with branches in the Niger Delta oil rich region of Delta state. The hospital has

over 300 bedding capacity takes well over 1000 deliveries in a year. The NICU has an in-born and an out-born section with a combine capacity to admit about 15 neonates at a time. The unit had 5 incubators, 2 Bubble-CPAP, piped oxygen, 3 radiant heaters and 5 phototherapy units. The unit is manned by two neonatologists, 4 paediatric nurses, 2 medical officers and other supporting staff like ward orderlies, biomedical engineers, laboratory scientist and technicians.

The study is a review of all cases admitted into the NICU of Lily hospital from 1st January 2019 to 31st December 2019. Ethical approval was from the Ethics committee of the hospital. The hospital operates an Integrated Electronic Health Record (IEHR) where patient's data are processed, stored and retrieved in an electronic form. Data on neonates admitted into the facility were retrieved from the IEHR and they included; age, sex, birth weight, place and mode of birth, educational status and occupation of parents, diagnoses, parity, maternal age and treatment outcomes. Data collected were entered into Microsoft Excel spreadsheet and data analysis was by SPSS version 23. Frequencies and percentages of categorical variables were obtained while means and standard deviations were determined for continuous variables. The direct causes of deaths were documented and their prevalence determined. Associations between independent variables (possible risk factors) and the dependent variable (death) were determined using a chi square test and logistic regression. The level of significance for statistical analysis was set at a *p*- value < 0.05.

Results

There were 113 admissions into the NICU during the study period; however, 2 admissions were excluded as they were considered previable, both occurring at 20 weeks gestation with a birth weight of 500 grams each. Out of the 111 admissions reviewed, 58 (52.3%) were females and 53(47.7%) were males. Seventy two (64.9%) were delivered via caesarean section, 57 (52.4%) were preterm neonates and 54 (47.7%) were term neonates. The mean gestational age and mean birth weight were 35.9 (4.1) weeks and 2.6 (1.0) Kg respectively as shown in table I and II

Forty (36.0%) neonates admitted for respiratory distress syndrome (RDS), 13 (11.7%) were cases of neonatal sepsis (NNS) while 12 (10.8%) were cases of birth asphyxia as shown in figure 1.

There was significant association between place of delivery, booking status and mortality with a p-value less than 0.05 as shown in table III.

On further analysis, un-booked pregnancies {AOR= 4.6; 95%CI (0.8-26.7) p= 0.01}, and delivery in a PHC {AOR= 2.2; 95%CI (1.1-4.4); p = 0.04} were the most important predictors of mortality as shown in table IV.

Ninety-one (82.0%) neonates were discharged, 13 (11.7%) died and 3 (2.7%) were referred for further care as shown in table VI. Prematurity with RDS and NNS had the highest case fatality rate as shown in figure 2.

Table I: Distribution of neonates into gender, booking status, maturity, place of delivery, mode of delivery, weight

Variable	**Freq (%)**
Sex	
Male	**53 (47.7)**
Female	**58 (52.3)**
Booking Status	
Booked	**102 (91.1)**
Not Booked	**009 (07.9)**
Mode of Delivery	
Caesarean Section	**72 (64.9)**
Vaginal Delivery	**39 (35.1)**
Maturity	
Preterm	**57 (52.4)**
Term	**54 (48.6)**
Place of Delivery	
Tertiary Health Facility	**98 (88.3)**
Secondary Health Facility	**05 (04.5)**
Primary Health Facility	**08 (07.2)**
Birth Weight	
Low Birth Weight	**45 (40.5)**
Normal Birth Weight	**66 (59.5)**
Social Class	
Upper	**16 (14.4)**
Middle	**95 (85.6)**
Lower	**00 (00.0)**

Table II: Mean, range, minimum, maximum values for age, gestational age, birth weight and days on admission and pack cell volume

Variable	Range	Min	Max	Mean (SD)
Age (days)	13	1	14	2.1(2.4)
Gestation (wks)	16	26	42	35.9 (4.1)
Birth wt (Kg)	3.6	0.6	4.2	2.6 (1.0)
Admission Duration (days)	84	1.0	84.0	9.7 (15.9)
Maternal age (yrs)	25	20	45	30.5 (5.9)

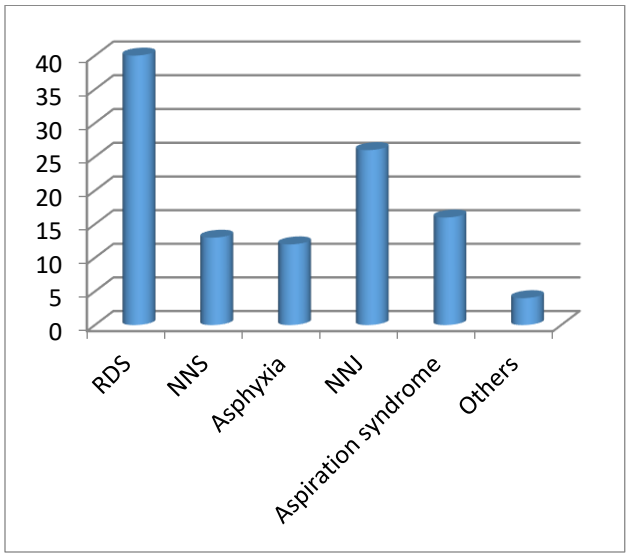

Figure 1: Bar chart on Clinical Diagnoses

Table III: Association between variables and mortality

Variable	Survived	Died	Df	X^2	p
Sex					
Male	47(88.7)	6(11.3)			
Female	51 (87.9)	7(12.1)	1	0.02	0.90
Facility					
Tert.	89 (90.8)	9 (9.2)			
Pry/Sec	09 (69.2)	4(30.8)			0.04*
BKN					
Booked	93 (91.2)	9(8.8)			
preg		4(44.4)	1	10.15	0.01
Unbkd preg	05 (55.6)				
MOD					
VGD	34 (87.2)	5(12.8)			
CS	64 (88.9)	8(11.1)	1	0.07	0.79
Gest.					
Preterm	48 (84.2)	9(15.8)			
Term	50 (92.6)	4 (7.4)			0.24*
Weight class	38 (82.6)	8(17.4)			
< 2.5 kg	60 (92.3)	5 (7.7)	1	2.7	0.10
≥ 2.5 kg					

- *** (Fischer Exact Test)**

Table IV: Predictors of neonatal mortality using logistic regression

		95% C.I	
	AOR	Lower	Upper
Sex	.648	.153	2.739
Gestational Age	1.032	.744	1.432
Booking Status	4.625	.800	26.734
Mode of Delivery	.266	.053	1.346
Place of Delivery	2.197	1.102	4.378
Birth Weight	.185	.032	1.062
Constant	1.463		

Table V: Outcome of treatment

	Frequency	Percent
Discharged	91	82.0
Death	13	11.7
SAMA	04	3.6
Referred	03	2.7
Total	111	100.0

SAMA = signed against medical advise

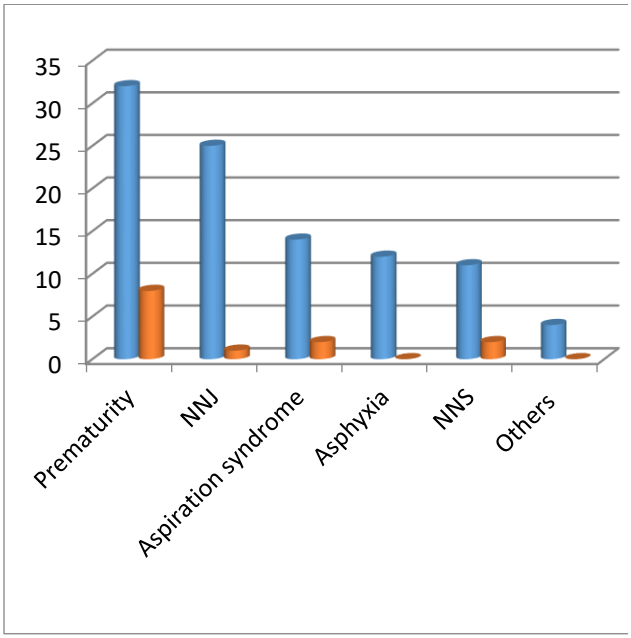

Figure 2: Proportion of mortality by cases

Discussion

The commonest indications for admission were respiratory distress syndrome (RDS), neonatal jaundice (NNJ) and meconium aspiration syndrome. This finding is different from reports from studies carried out in public tertiary health institutions in developing countries where prematurity, neonatal sepsis (NNS) and asphyxia were the commonest indications for admission into the newborn unit.[6-9] The reason for the lower frequency of asphyxia and NNS in the present study is probably due to the fact that more than 90% of the women in the present study were booked and 72 (67.9%) deliveries were caesarean sections reflecting a high interventional rate during labour. The morbidity pattern is however comparable to a study carried out in Jordan, a developed country located in Western Asia, where prematurity and NNJ were the leading indications for admission into the newborn unit.[10]

The proportion of neonatal mortality in the present study was 11.7%, a value lower than reported values in public tertiary health institutions in Enugu[5] (Eastern Nigeria); in Ibadan[6] (Western Nigeria) and in Jos[11] (Northern Nigeria). The proportion of neonatal death in the present study was equally lower than reported values in hospitals in Ethiopia[12] and Nepal[13]. Most deaths recorded occurred among preterm neonates with RDS and this is not surprising as preterm neonates contributed to more than 60% of the admissions into this private facility. The other causes of neonatal deaths were meconium aspiration syndrome, NNS and NNJ in decreasing order of importance. The present finding is similar to what has

been reported from other facilities in developing countries where prematurity, NNS and asphyxia top the list of the causes of neonatal deaths.[6-8] However, nso mortality was recorded among neonates admitted for asphyxia in the present study, and is probably due to the high rate of intervention during labour at the study facility.

Unsupervised pregnancy and delivery in a Primary Health Centre (PHC) were more significantly associated with neonatal mortality in the present study. Neonates delivered to mothers whose pregnancy were unsupervised were 5 times more likely to die than others and neonates delivered in a PHC were twice more likely to die than others. This finding is consistent with a study in a public health institution in Southern Ethiopia were unsupervised pregnancy had 6 times risk of death when compared to other neonates.[14] In another study in a public health institution in Ilesha, Western Nigeria, unsupervised pregnancy and delivery in missions and homes were found to be the major determinants of neonatal mortality.[15] However, the study at Ilesha also found teenage pregnancy and low social class as important predictors of neonatal mortality. The present study has not found teenage pregnancy and low social class as important predictors of neonatal mortality and this is because the study population has neither teenage mothers nor mothers from lower socioeconomic class. It thus appear that while the neonatal morbidity and mortality pattern may vary from public to private health institutions, the determinants or predictors of mortality are invariably similar.

The finding of delivery in a PHC as an important predictor of mortality in the present study and the report of delivery in missions and homes as a predictor of mortality in the study at Ilesha are comparable. Though these findings must be interpreted cautiously as the mere delivery in these places do not necessarily imply an increased risk of mortality. However, these neonates were neonates who developed complications following deliveries at the referring centres and usually timely referral and timely presentation for management in the tertiary health facility could improve the outcome of such neonates. Another important measure to improve the treatment outcome of these neonates could be intrauterine transfer to a tertiary facility that can manage both the delivery and the newborn.

Conclusion: The commonest indications for admission into the NICU were prematurity, NNJ and meconium aspiration syndrome. Unsupervised pregnancy and delivery in a

Primary Health Care facility were the most important determinants of mortality.

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