

# ASSESSMENT OF NEONATAL MORTALITY AMONGST SICK NEONATES IN THE SPECIAL CARE BABY UNIT OF A TERTIARY INSTITUTION IN ORLU, NIGERIA

## Abstract:

**Introduction:** Neonatal mortality constitutes more than 41% of under 5 mortality in sub-Saharan Africa, despite advancement in technology and concerted effort aimed at decreasing under-five mortality. This study aims at assessing the risk factors and causes of neonatal mortality among sick infants the special care baby unit(SCBU); focusing at identification of possible areas of improvement in care and result.

**Method:** A retrospective review of medical records of sick neonates admitted into SCBU) of Imo State University Teaching Hospital Orlu. Sociodemographic and clinical characteristics were obtained from 948 sick neonates who died. Descriptive statistics was used to summarize data, logistic regression test at 95% level of significance was used to determine the association between independent variables and neonatal death. Values of  $p < 0.05$  were considered significant.

**Results:** A total of 948 sick neonates were admitted into SCBU, with a neonatal mortality rate of 22.6%. Complications of prematurity 78 (36.7%), severe birth asphyxia 63(29.6%) and neonatal sepsis 31(14.6%) are the leading causes of death with majority of death occurring in the first 24 hours of life 130(60.8%). Low birth weight [OR=2.59 (95% CI 1.84-3.54)], prematurity [OR=2.79 (95% CI 2.03-3.83)] and spontaneous vaginal deliveries [OR=1.85 (95% CI 1.32-2.60)] were positively associated with increased mortality. While Caesarean section as mode of delivery [OR=0.54 (95% CI 0.38-0.76)] and birth weight  $>2.5-4.0\text{kg}$  [OR=0.46 (95% CI 0.34-0.64)] significantly reduced neonatal mortality.

**Conclusion:** Neonatal mortality rate is still unacceptably high, with complications of prematurity, severe birth asphyxia and neonatal sepsis contributing the highest percentage of poor outcome (death). Low birth weight, prematurity, and spontaneous vaginal deliveries were positively associated with increased mortality. Multidisciplinary measures aimed at reduction of neonatal morbidity and mortality such as improving the utilization of antenatal care services, quality of care at delivery, and at the neonatal intensive care unit needs be strengthened.

**Keywords:** Neonates, Morbidity, Mortality, Admissions, Assessment

## INTRODUCTION

Childhood mortality rates are still very high in this part of the world despite concerted efforts to lower under 5 (U5) mortality and achieve the United Nations (UN) millennium developmental goal 4 and Sustainable development goals target 3 target 3.2.<sup>1, 2,3,4,5</sup>

Neonatal death continues to remain a significant public health issue in Nigeria. The risk of death in the first 28 days of life is 15 times greater than any other times in the first year of life.<sup>6</sup> Despite government and several stakeholders efforts, neonatal deaths still remains high at 41.0% for under 5 years olds.<sup>6</sup> In view of these gory statistics, effort at reduction of childhood mortality rates should be focused on reducing the high rates. Unfortunately current efforts aimed at reducing Under 5 mortality in Nigeria, is tilted in favor of childhood mortality to the detriment of neonates. This bias has significantly contributed to the higher documented neonatal and under 5 mortality rates.<sup>7</sup> It is sad to note that approximately 98% of neonatal deaths globally occur in the developing world characterized by low incomes.<sup>8</sup> In other to achieve the Sustainable developmental goals in Nigeria, government need embrace the global strategy for every newborn action plan, launched in 2014 and adopted as a World Health Assembly resolution.<sup>7</sup> This action plan involves provision of quality care for the newborn, promotion of facility based delivery of newborns and strengthening of the health facility. Essentially, care for small preterm and low birth weight baby and prevention of infections forms the pivot for quality care for the newborn. Therefore assessing mortality and causes of death of sick newborns in the Nigerian context is essential, because continued research and quality improvement are necessary to address the complex challenges of neonatal mortality. This retrospective study, therefore aims to determine

the incidence, causes and risk factors of neonatal death, focused at identification of possible areas of improvement in care and overall health outcome of sick newborns.

## **METHODOLOGY**

### **Study Setting**

The study setting is the Special Care Baby Unit (SCBU) of the department of Paediatrics Imo State University Teaching Hospital situated in Orlu Imo State. The unit provides services to patients from the state and adjoining states. The SCBU with inborn and out-born sections provides level II care for sick neonates. Inborn babies are admitted through the institutions department of Obstetrics and Gynaecology, while out-born babies are referrals from peripheral hospitals in and out of the state. The unit is supervised by Consultant Paediatricians (Neonatologist) with Residents doctors (Senior/Junior registrars) available all day.

Orlu is a cosmopolitan town, with mainly Igbo inhabitants, engaging in traditional occupations and petty trading. It is a semi urban town approximately 30 km by road from Owerri the capital of Imo state. Orlu is located in the tropical rain forest of South Eastern, Nigeria. It lies within latitude  $5^{\circ} 43' 45''$ N to  $5^{\circ} 53' 00''$ N and longitude  $7^{\circ} 7' 30''$ E. It is the third largest city in Imo state with a population of about 420,000 covering a surface area of 12935.6km<sup>2</sup>. Annual rainfall varies between 1990mm and 2200mm. The mean annual temperature is about 27<sup>0</sup>C with relative humidity of 75%.<sup>9</sup>

### **Study design/ Study Population**

This was a retrospective analysis of medical records of sick neonates admitted into the SCBU of a tertiary health facility in Orlu Nigeria who died, over a five year period (2018-2022).

Medical records of the subjects obtained from the medical records department and SCBU over the study period were reviewed. Information obtained included diagnosis, gender, place of birth, birth weight, gestational age at delivery, duration of stay in the hospital, mode of delivery and outcome were recorded on a proforma. The disease conditions, for which they were admitted, were categorized based on the international classification of diseases-Perinatal period- XVI (ICD-10) World health organization.

The criteria for the various categories of admission diagnosis are:

1. Prematurity- babies delivered to mothers before 37 completed weeks from the first day of the last menstrual period.
2. Birth asphyxia- low Apgar score of 5 at 10 minutes with respiratory distress requiring continuous resuscitation.
3. Neonatal sepsis- evidence of systemic inflammatory response and clinical evidence of systemic infection.
4. Meconium aspiration syndrome- Respiratory distress in the setting of meconium containing amniotic fluid with radiograph showing hyperinflation, atelectasis and flattening of the dome of the diaphragm.

Information from the proforma was transferred to SPSS version 24 and analyzed. Descriptive statistics was used to summarize data. Frequencies, ratios and percentages were calculated. A bivariate logistic regression analysis was carried out to examine the association between the independent and outcome variable. Where appropriate odds ratio at corresponding 95% confidence interval were computed and presented as a measure of association. Values of  $p < 0.05$  were considered significant.

## **RESULTS**

### **Yearly trend in admission and mortality.**

A total of 948 sick neonates were admitted into the Special care baby unit over the 5 years period of review. Two hundred and fourteen of these babies died while 734 survived under the period of review. This corresponds to an overall neonatal mortality rate of 22.6% and survival rate of 77.4%. Yearly trend in mortality distribution showed neonatal mortality rate ranging from 17.5% in 2018 to 25.3% in 2022. Depicted in table 1 is the yearly trend of neonatal mortality.

### **Demographic characteristics of neonatal mortality and association between demographic characteristics of neonates and neonatal mortality**

Of the 214 babies that died 132(61.7%) were male, while 82(38.3%) were female, resulting in a male/ female mortality ratio of 1.6:1.0. Majority (54.6%) of the neonates admitted into SCBU were inborn, while 45.4% were out born. Out of the 214 neonates that died, 126(58.9%) were inborn, 115 (53.7%) of whom were low birth weight neonates, while 88(41.1%) were out born. Preterm neonates were 99 (36.4%) of the 214 that died, while out of the 635 term neonates admitted 105(16.5%) died. Majority of deaths 60.8%, occurred in the first 24 hours of admission irrespective of the cause of death. During the period under review, 26.2% of mortalities were delivered through Caesarean section, while 73.8% were products of spontaneous vaginal delivery. Gender and place of birth were not significantly associated with neonatal mortality [OR 1.0879, 95% (CI 0.7958, to 1.4871)]. However, birth weight [OR 0.3911, (CI 0.2826, 0.5412)]

gestational age at birth [OR 0.3462, (CI 0.2504, 0.4786)], duration of stay in the hospital [0.0301, (CI 0.0181, 0.0502)] and mode of delivery [0.5396, (CI 0.3845, 0.7571)] were significantly associated with neonatal mortality. This is shown in Table 2.

### **Major causes of Neonatal death**

In table 3, complications of prematurity are shown as the leading cause of death 78(36.4%) followed in descending order by severe birth asphyxia 63(29.4%), severe neonatal sepsis 31(14.6%) and multiple congenital malformations 16(14%), severe neonatal jaundice 9(4.2%), severe neonatal respiratory disease 8(3.8%), severe hypoglycaemia 1(0.5%), severe neonatal anaemia 1(0.5%). The case fatality rate was highest amongst sick neonates admitted for severe neonatal respiratory distress (57.1%), followed by complications of prematurity (33.2%).

### **Discussion**

Neonatal mortality is still high and available evidence advocates for constant appraisal. In resource poor settings, the bulk of neonatal mortality occurs as a result of poor quality of care during the antenatal, intrapartum, and postpartum periods. This study showed that the extent of neonatal mortality was a high 22.6%, which maybe a reflection of the current neonatal mortality rate of 32.9% in Nigeria. This finding is consistent with findings by other workers in other parts of the Nigeria; Okposio and Igbosewe<sup>1</sup> in Niger delta, 20.3%, Toma et al<sup>2</sup> 19.4% in North Central, Obi and Onyire<sup>3</sup> 19.5% South East, Yola and Iliyasu<sup>4</sup> 16.9% North West and Imodu IA et al<sup>5</sup> 19.3% North East. The slight difference in neonatal mortality rate might be due to sociocultural and socioeconomic diversity across different geographic regions in Nigeria. Comparatively these neonatal mortality rates are much higher than figures obtained from other

parts of the developed world in places such as United States of America 3.88%, France 2.6%, Germany 2.7%, Norway 2.1% and Italy 2.8%.<sup>11</sup> The high neonatal mortality rate in Nigeria may be due to poor service utilization including, poor obstetrics management, giving birth at health institutions without skilled care providers, lack of trained manpower and equipment for adequate respiratory support.

Neonatal mortality is a reliable index for evaluating the overall progress of neonatal and perinatal care in a community and in a wider context it is a valuable indicator of the standard of countries educational, community and national health system.<sup>12</sup> Available data from this study seems to show increasing neonatal mortality rates from 2014 to 2018. This may be a reflection of worsening socioeconomic situation of the average Nigerian/ child, decaying infrastructure in the health sector and health worker migration to saner climes “japa syndrome”.

Male preponderance was observed in the gender distribution of neonatal mortality with male/female ratio of 1.6:1. Other studies have consistently reported similar findings as documented by Toma et al<sup>2</sup> in Jos who obtained a male female neonatal mortality ratio of 1.4:1, Akpan in Uyo<sup>12</sup> Okposio<sup>1</sup> in Ughelli both in Southern Nigeria obtained a neonatal mortality ratio of 1.3:1, 1.7:1 respectively. In this study, sex differentials does exist however the differences were not statistically significant. Sex differentials in childhood mortality have been a topical issue amongst researchers and epidemiologists. Newborn girls have a biological advantage in survival over newborn boys; they have less vulnerability to perinatal conditions such as intra uterine hypoxia and birth asphyxia, prematurity and respiratory distress syndrome<sup>13</sup> This biological advantage is compromised by discrimination against girls in certain population

especially in the West African region with the female child less likely to be brought to hospital when sick than the male child.<sup>14</sup>

From this study majority of the sick neonates admitted during the period of study were delivered in the hospital (58.9%), while 41.1% were sick neonates delivered outside the hospital and referred to the hospital. The mortality rate of the inborn neonates of 24.3% was higher than the mortality rate of 20.5% amongst neonates delivered outside the hospital. This is in contrast to findings by other workers in different centers in this area.<sup>15,16</sup> Probably this may be due to the fact that most of these deliveries within the hospital were complicated cases of labour referred from outside the hospital for delivery within the hospital, a result of poor health seeking behavior of the economically challenged population. This may also be so because of the higher proportion of inborn babies admitted into the SCBU since this difference was not statistically significant.

In this study low birth weight was positively associated with neonatal mortality in the SCBU [(CI=1.84 to 3.54) p value = <0.0001, OR = 2.29] with majority of neonates who died (53.7%) during the course of study been low birth weight babies. These findings are in keeping with a majority of studies<sup>17, 18</sup> on the outcome of low birth weight neonates in these parts of the world and maybe a reflection of the poor facilities available in these health institutions for the management of these low birth weight babies. Generally low birth weight babies are associated with higher fatal outcomes, prolonged hospital stay and more comorbidity. It becomes imperative that identifying and eliminating the predisposing factors to delivering babies with low birth weight should be the main thrust in the management of these children rather than treating them.

This study also revealed that prematurity is positively associated with mortality in SCBU where 36.4% of preterm admitted into SCBU died. Complications of prematurity were noted to be the leading cause of death 36.7% followed by severe birth asphyxia. This finding is in keeping with findings obtained by other workers in this part of the country.<sup>1, 12, 19</sup> The case fatality rate for complications of prematurity is 33.2%, the second highest following severe neonatal respiratory distress. Essentially majority of these neonates may have died as a result of failure of adaptation to extra uterine life that required urgent resuscitation. Resuscitation of the small immature neonates required sophisticated and costly equipments, well trained efficient personnel and the right infrastructure such as electricity, clean potable water etc. Unfortunately, these requirements for successful resuscitation of the newborn babies are lacking in most tertiary health institutions, compounded by the paucity of well trained health workers (no thanks to the “Japa” migration syndrome). Thus, it is not surprising that 60.8% of neonatal death over the study period occurred within 24 hours of admission. These were mainly small premature babies and neonates with birth asphyxia who needed urgent resuscitation within the first few hours of admission to stay alive. Behnaz et al<sup>20</sup> in Iran noted that 25% of premature neonate had earlier mortality, Yismaw and Terekgn<sup>21</sup> in their study noted the high proportion of preterm neonatal death and concluded that improved infrastructure and presence of skilled manpower is important in providing special care for preterm to avoid complications due to prematurity.

With regards to the mode of delivery, the differences in the outcome of these babies were remarkably significant. Neonates delivered through caesarean section and admitted into the SCBU experienced lower mortality than those who were admitted following delivery through spontaneous vaginal delivery. Similar findings were noted by other workers in this part of Nigeria,<sup>22,23</sup> Delivering of the fetus through an abdominal and uterine incision represents the

most significant operative intervention in obstetrics practice. It has immensely improved maternal and fetal outcomes of pregnancy in Nigeria.<sup>24</sup>

## **Conclusion**

The prevalence of neonatal mortality rate was high comparable to the National values and a reflection of the poor national health index. This study highlights the importance of early detection and prompt intervention as delay in diagnosis; poor facilities for resuscitation/respiratory support and management of neonates within the first 24 hours of life are major contributors to the high neonatal mortality rate. Cultivating improved utilization of ANC, promotion of hospital delivery, quality care for the newborn, provision of respiratory support (manpower and equipments), strengthening the health facilities infrastructure, establishing standard protocols for management training and retraining of newborn staff to provide optimal care for this vulnerable would prevent newborn deaths.

## **What is already known on this topic**

Neonatal mortality rate is high in Nigeria

Male neonates are at a higher risk of death than females

Low birth weight is a significant predisposing factor to maternal death.

## **What this study adds**

Complications of prematurity is the leading cause of death in our SCBU

Case fatality rate is highest with neonatal respiratory distress in our SCBU

Most deaths occurred in the first 24 hours of admission into the SCBU

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**Table 1. Yearly Trend in admission and mortality**

Year	Total Admission	Total Mortality(n)	Mortality rate %
2018	212	37	17.5%
2019	213	39	18.3%
2020	163	40	24.5%
2021	194	56	28.8%
2022	166	42	25.3%
	948	214	22.5%

**TABLE 2: ASSOCIATION BETWEEN THE DEMOGRAPHIC CHARACTERISTICS OF NEONATES AND NEONATAL MORTALITY**

Demographic	n <sub>o</sub>	Mortality	Survival (%)	OR	95% CI	Pvalue
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characteristics		(%)				
<b>Gender</b>						
Male	570	132(61.7)	438(59.7)	1.0879	(0.7958, 1.4871)	0.5974
Female	378	82(38.3)	296(40.3)	1	-	-
<b>Place of birth</b>						
Inborn	518	126(58.9)	392(53.4)	1.2492	(0.9170, 1.7006)	0.1575
Out born	430	88(44.1)	342(46.6)	1	-	-
<b>Birth weight</b>						
<2.50kg	363	115(53.7)	218(33.8)	1	-	-
2.50-4.0kg	467	85(39.7)	412(56.1)	0.3911	(0.2826, 0.5412)	<0.001
>4.0kg	88	14(6.6)	74(10.1)	0.3586	(0.1940, 0.6629)	0.0011
<b>Gestation</b>						
Preterm	272	99(46.3)	173	1	-	-
Term	635	105(49.1)	530	0.3462	(0.2504, 0.4786)	<0.001
Post term	41	10(4.6)	31	0.5367	(0.2651, 1.1986)	0.1364
<b>Duration of stay</b>						
<24hrs	154	130 (60.8)	24(3.3)	1	-	-
7-days	442	62(29.0)	380(51.8)	0.0301	(0.0181, 0.0502)	<0.001
8-30days	321	21(9.8)	300 (40.8)	0.0129	(0.0069, 0.0240)	<0.001

>30 days	31	1(0.4)	30(4.1)	0.0062	(0.0008, 0.0473)	<0.001
<b>Mode of delivery</b>						
-Cesarean	347	56(26.2)	291(39.6)	0.5396	(0.3845, 0.7571)	0.0004
-SVD	601	158(73.8)	443(60.4)	1	-	-

**Table 3. Major causes of Neonatal death**

Diagnosis	n <sub>o</sub>	Mortality (%)	CFR
Complication of Prematurity	235	78(36.7)	33.2
Severe Birth Asphyxia	257	63(29.6)	24.5
Severe Neonatal Sepsis	163	31(14.6)	19.0
Multiple congenital malformations	67	16(7.4)	23.9

Severe Neonatal Jaundice	133	9(4.2)	6.8
Severe Neonatal Respiratory disease	14	8(3.8)	57.1
Meconium Aspiration Syndrome	14	4(1.9)	28.6
Small for Gestational Age	20	3(1.4)	15.0
Severe hypoglycemia	5	1(0.5)	20.0
Severe Neonatal anaemia	7	1(0.5)	14.3
		214(100)	

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