



# Causes of Illness and Preterm Infant Deaths in a Low Resource Setting in Southern Nigeria: A 5 Year Review

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## Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

## Article Information

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## ABSTRACT

**Background:** About 45% of deaths among under-fives occur during the neonatal period with a high contribution from preterm infant deaths. Regular evaluation of preterm deaths is important as patterns and therefore intervention may vary at different times and places.

**Objectives:** To determine the common causes of illness and death among preterm infants admitted to the Special Care Baby Unit (SCBU) of the University of Port Harcourt Teaching Hospital (UPTH), over a 5 year period.

**Methods:** This was a retrospective review of data of preterm babies admitted to the SCBU from 2012 – 2016. Information obtained included biodata, nature of illness, duration of admission and outcomes. Data were collated and analyzed using SPSS v20 for windows.

**Results:** 3,071 babies were admitted in SCBU over the period, of which 683 (22.2%) were preterms. Of these, 421 (61.6%) were in-born while 262 (38.4%) were out-born. The male: female ratio was 0.9:1. Morbidity patterns varied with birth asphyxia (20%) ranking highest among in-borns while sepsis (21%) and neonatal jaundice (15%) were more prominent in out-borns. The overall preterm mortality rate was 24.6 % with rates being significantly higher in out-born 30.5% versus in-born 20.9% ( $p=0.004$ ). Mortality was highest among low birth weight preterms. Admission rates decreased steadily over the period.

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**Conclusion:** Birth asphyxia and sepsis were the main morbidities recorded. Mortality rates were higher among outborns. Low birth weight preterms were most affected because they were in the majority. There was a steady decline in admission rates. Improving obstetric care, neonatal resuscitation, infrastructure and subsidizing healthcare services for preterms is needful.

*Keywords: Preterm; illness; admissions; deaths; low resource setting.*

## 1. INTRODUCTION

About 45% of deaths in under-fives occur during the neonatal period with a high contribution from preterm births.<sup>1</sup> According to WHO, more than 60% of preterm babies are born in sub-Saharan Africa and south Asia combined [1,2]. Of the 15 million babies born preterm, complications mostly sepsis, directly contributes to one million deaths [1,3,4]. Nigeria has the third highest number of under-five deaths in the world and a major contributor to these deaths are complicated preterm births. In 2016, of 871,000 babies delivered, 98,300 died from direct complications of preterm birth [5,6].

In Nigeria, majority of preterm babies are delivered between 32 and 37 weeks of pregnancy and do not require specialized neonatal care to live [7]. However, for preterms that do need intensive care, challenges arise from limited and poorly-equipped specialized newborn care units to very expensive costs for neonatal care [8]. Currently, there are low-cost, evidence based interventions like neonatal resuscitation, kangaroo mother care, early commencement of antibiotics and exclusive breastfeeding that have been shown to help improve preterm survival, even in resource-limited settings [1,9]. However, in Nigeria, majority of births occur outside of institutionalized health facilities [10] and so the likely contributors to preterm morbidity and mortality may differ between out-born (referrals) and in-born (hospital-born) babies. In order to appropriately institute preventive measures to improve preterm survival, it is important to regularly report patterns and trends in preterm morbidity and mortality against which future performance can be compared. The aim of this study was to determine the causes of illness and death among preterm infants admitted to the Special Care Baby Unit (SCBU) of the University of Port Harcourt Teaching Hospital (UPTH), Rivers State, Southern Nigeria.

## 2. MATERIALS AND METHODS

This was a retrospective review of data of preterm babies admitted into the SCBU from

2012 – 2016. Information obtained were from the central medical inventory of the SCBU included biodata, nature of illness, duration of admission and outcomes. The SCBU is the neonatal unit of the hospital where neonates less than 28 days including preterm babies are admitted. The unit has an in-born and out-born section. The in-born section, caters for babies whose mothers had supervised antenatal care. Out-born admits those babies whose mothers did not have antenatal care and majority come from unorthodox centres. The unit as at the time of this review, had 35 cots, 6 incubators, no neonatal ventilators or CPAP machines. The unit is manned by 3 Paediatricians, Residents and Nursing staff with an average ratio of one nurse to 10 patients. Data were collated and analyzed using SPSS v20 for windows. Test of significance between proportions was assessed using Chi-square at a 95% confidence interval with a p-value of less than 0.05 considered statistically significant. Ethical clearance or consent of the neonates' parents/care giver was not obtained because the study was undertaken retrospectively.

## 3. RESULTS

A total of 3,071 babies were admitted in SCBU over the 5-year period. Six hundred and eighty-three (22.2%) were preterms. Of these, 421 (61.6%) were in-born, 262 (38.4%) were out-born (Tables 1 & 2). Of the preterms, females were 355 (53.4%). Male to female ratio was 0.9:1. There was no statistically significant difference in the sex distribution ( $X^2 = 2.1573$ ;  $p = 0.14$ ). The age of the babies at time of admission into SCBU ranged from 2 minutes to 48 minutes, median: 20 minutes, for in-borns and from 2 minutes to 20 day of life, median 5 days for out-borns. Duration of admission ranged from less than 24 hours to 1 month. There were a total of 168 (24.6%) preterm infant deaths, 86 (51.2%) females and 82 (48.8%) males. The difference was not statistically significant ( $X^2 = 2.0854$ ,  $p = 0.15$ ).

Pattern of common illnesses at admission (Table 3) varied between in-born and out-born preterms. Birth asphyxia 18 (20.5%) was highest followed by RDS 15 (17%) among in-born.

Neonatal Sepsis 17 (21.2%) and neonatal jaundice 12 (15%) were more prominent in out-born. Uncommon conditions (others) which were more in the out-born, included congenital malformations including congenital heart defects like ACHD - PDA and omphalocele.

Fig 1: Illustrates the trend in preterm mortality over the 5-year period between the in-born and out-born SCBU admissions. The overall preterm mortality rate was 24.6%. The preterm mortality rate of 30.5% in out-born was significantly higher than 20.9% in-born ( $X^2=8.0779, p=0.004$ ).

The pattern of distribution of preterm infant deaths by birthweights (Table 3) shows that 37(22%) were ELBW (bwt < 1 kg) and 93(55.4%) were LBW (bwt 1.5kg < 2.49 kg). There was a significantly higher out-born LBW preterm infant deaths compared to in-born LBW group ( $X^2=7.0998, p=0.007$ ).

Fig 2: Illustrates trend in preterm admission and depicts that admission rates decreased over the 5-year period but this was not linear and not statistically significant ( $X^2= 7.5335 p= 0.11$ ).

**Table 1. Yearly distribution of SCBU (IN-BORN) admissions and preterm infant deaths**

Year	Total admissions	Preterm admissions	Male	Female	Preterm deaths	Male	Female
2012	485	117	59	58	22	11	11
2013	386	120	52	68	29	17	12
2014	212	52	25	27	5	4	1
2015	336	81	39	42	18	12	6
2016	224	51	28	23	14	7	7
Total	1643	421	203	218	88	51	37

**Table 2. Yearly distribution of SCBU (OUT-BORN) admissions and preterm infant deaths**

Year	Total admissions	Preterm admissions	Male	Female	Preterm deaths	Male	Female
2012	358	82	34	38	21	9	12
2013	262	60	23	37	23	6	17
2014	197	36	16	20	7	3	4
2015	307	39	19	20	16	8	8
2016	304	45	23	22	13	5	8
Total	1428	262	115	147	80	31	49

**Table 3. Pattern of common illnesses at admission among preterm infants that died**

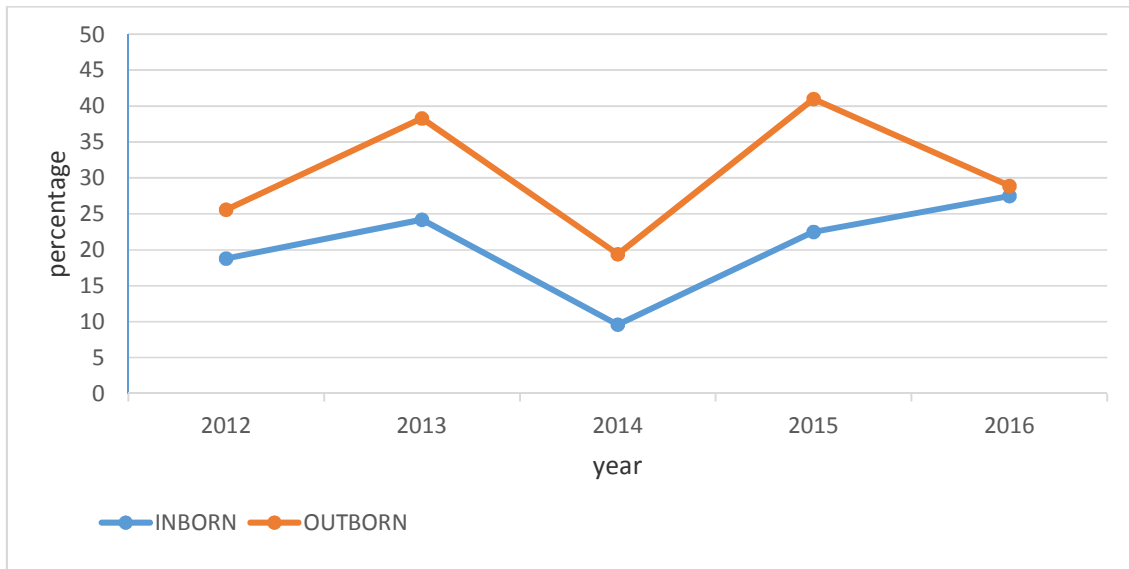
WARD	Total deaths	Birth asphyxia	RDS	NNJ	NNS	Others	Prematurity (no specific documented co-morbidity)
INBORN	88	18(20.5%)	15(17%)	12(13.6%)	10(11.4%)	5(5.7%)	28(31.8%)
OUTBORN	80	10(12.5%)	7(8.7%)	12(15%)	17(21.2%)	9(11.3%)	25(31.2%)
P-values		0.16	0.11	0.80	0.08	0.23	0.94

**Table 4. Yearly distribution of preterm infant deaths in SCBU categorized according to birth weights**

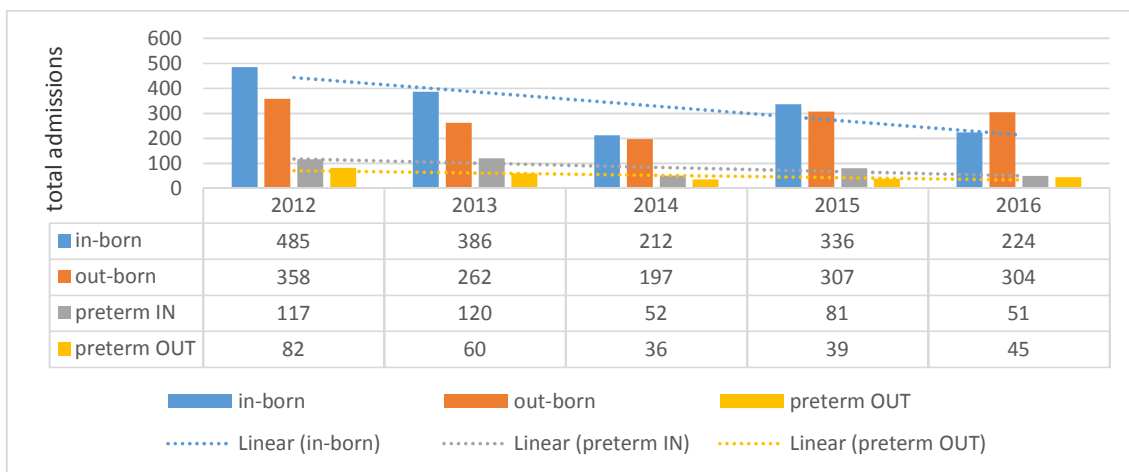
Year	IN-BORN				OUT-BORN			
	Preterm deaths	ELBW (<1 kg)	VLBW (≥1 <1.5 kg)	LBW (1.5<2.5 kg)	Preterm deaths	ELBW (<1 kg)	VLBW (≥1<1.5 kg)	LBW (1.5<2.5 kg)
2012	22	8	2	12	21	4	5	12
2013	29	3	6	20	23	2	7	14
2014	5	1	1	3	7	3	0	4
2015	18	5	6	7	16	1	5	10
2016	14	4	3	7	13	6	3	4
Total	88	21	18	49	80	16	20	44

**Table 5. Yearly distribution of preterm infants admitted in SCBU categorized according to birth weights**

Year	IN-BORN				OUT-BORN			
	Preterm admitted	ELBW (<1 kg)	VLBW (≥1 <1.5 kg)	LBW (1.5<2.5 kg)	Preterm admitted	ELBW (<1 kg)	VLBW (≥1 <1.5 kg)	LBW (1.5<2.5 kg)
2012	117	8	10	99	82	9	15	58
2013	120	3	13	104	60	3	12	45
2014	52	1	7	44	36	4	5	27
2015	81	5	9	67	39	1	6	32
2016	51	4	7	40	45	5	9	31
Total	421	21	46	354	262	22	47	193



**Fig. 1. Inborn and outborn preterm mortality trends**  
(Chi-square statistic is 4.8087, p-value = 0.028)



**Fig. 2. Trends of preterm admission from 2012 - 2016**  
(Chi-square statistic is 7.5335, p-value = 0.11)

#### 4. DISCUSSION

The preterm admission rate of 22.2% in the study is similar to the 24% reported by Kunle-Olowu et al [11] at the Niger Delta University Teaching Hospital, Bayelsa State in Southern Nigeria but more than the 16.4% reported by McGill Ugwu et al. [12] at the Delta State University Teaching Hospital, Warri, also in Southern Nigeria and 18.9% reported by Orimadegun et al. [13] in UCH, Ibadan, Western Nigeria. It was however, less than the 28.8% by Khan et al. [14] at Khyber Teaching Hospital (KTH), Peshawar, Pakistan and 31.3% reported by Onwuanaku et al. [15] at Jos University Teaching Hospital, Jos, North-central Nigeria, and 50.35% reported by Rakholia et al. [16] at teaching hospital of Uttarakhand, India. The reason for the difference between various regions may be due to geographical/ environmental differences. In southern Nigeria for example, where crude oil exploration is common, there are higher exposures to air pollutants and environmental toxicants which have been linked to increased risk for preterm births [17].

There were more preterm female infants admitted over the study period which is similar to the study by McGill Ugwu et al. [12] in Warri and Zeleke et al. [18] in Ethiopia but differed from Kunle-Olowu et al.<sup>11</sup> findings in Bayelsa State, Nigeria, where preterm male infants were more in number. The reason for the difference cannot be readily explained.

The major reason for admission to in-born or out-born unit was preterm delivery. However the commonest illness at admission in the preterm infants who died in the present study varied depending on whether in-born or out-born. The finding that birth asphyxia was the commonest illness among in-born preterm infants could be that birth asphyxia was over diagnosed, as lower APGAR scores are observed with decreasing gestational age due to physical and neuromuscular immaturity. [19] Sepsis which was most common illness among the out-born preterm infants was similar to report by Khan et al [14]. This could be due to unhealthy delivery practices at home and unorthodox centres [20,21].

The overall preterm mortality rate of 24.6% was higher than 20.3% reported by Gibbs et al. [22] but lower than 29% reported by Khan et al. The reason for this could be the shorter duration of 6-12 months used in these studies. The preterm

mortality rate in out-born was significantly higher than in-born. This was similar to a study among VLBW preterm infants by Gibbs et al. [22] that reported mortality rate of 18.4% among in-born and 33.3% for out-born. It can be inferred that babies whose mothers received antenatal care and were delivered in hospital would have better outcomes as their problems are anticipated and management instituted early. In this study, preterm infants admitted in the out-born were referred from peripheral centres, homes or unorthodox centres. These preterm infants had higher risks of infections and hypothermia due to premature immune systems, lack of neonatal transport services in the State and late presentation. [13] More preterm female infants died compared to their male counterparts which is in contrast to findings reported by other studies [15,22]. This could be because overall, more preterm female infants were admitted.

The pattern of distribution of preterm infant deaths by birth weights showed that more LBW preterms died. Out-born LBW preterm infant deaths were higher compared to the in-born LBW group. This agrees with the report by Onwuanaku et al. [15], that birth weight is a better predictor of mortality being higher in babies born < 2.5 kg. Our findings however do not necessarily contrast with other studies that show ELBW babies had a higher mortality rate than the LBW preterms [14,23,24]. The finding was because LBW preterms were in the majority of babies admitted in this study.

There was a decline in admission rates in this study, the most drop occurred in 2014. This could be explained by the recurrent industrial strike actions and Ebola epidemic in Nigeria in 2014 [25,26]. However, because of the economic down-turn in the country, the hospital had reviewed prices upwards by almost 50%. In addition, the unavailability of a functional health insurance scheme could have accounted for the decreasing admission rates observed for both in-born and out-born babies.

#### 5. LIMITATIONS

The study is limited by its retrospective nature. This study describes a hospital-based population of neonates whose mothers' had resources to bring themselves or their babies to the hospital and does not therefore describe population-based mortality for the State. Those neonates admitted to the SCBU may not be representative of all neonates born in the State. The differences

in mortality between in-born and out-born babies who were admitted to the SCBU of UPTH, may in part be attributable to multiple selection biases but more importantly survival bias since comparing inborn vs. outborn has limited significance without analysing the data of deaths of preterm infants that could not arrived the hospital in time.

## 6. CONCLUSIONS

Birth asphyxia and sepsis were the main morbidities recorded. Mortality rates were higher among outborns. Low birth weight preterms were most affected because they were in the majority. There was a decline in admission rates. The major reason for admission to in-born or out-born unit was preterm delivery. However the commonest illness at admission in the preterm infants who died in the present study varied depending on whether in-born or out-born. Improving obstetric care, neonatal resuscitation, infrastructure and subsidizing healthcare services for preterms is needful.

## CONSENT AND ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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