Incidence and outcome of preterm deliveries in Mother and Child Hospital Akure, Southwestern Nigeria

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Abstract
Background: Preterm birth contributes significantly to neonatal deaths. Its burden should be defined to enhance interventions especially in resource-limited settings with poor neonatal health indices.

Objectives*:* To determine the incidence of preterm delivery in the Mother and Child Hospital, Akure, to investigate the outcome and explore the relationship between birth weight and neonatal survival.

Method*:* Demographic and clinical features (gestational age, birth weight and outcome) of consecutive preterm infants were documented for one and a half years. Incidence of preterm birth was computed, using total birth as the denominator. Quarterly incidence of preterm birth was presented graphically. Univariate logistic regression analysis of birth weight as a predictor of preterm death was done. P value <0.05 was considered significant.

Results*:* Of 10,432 births during study period, 1,606 were preterm giving an incidence of preterm births of 15.4%. Among preterm infants, 1,449 (90.2%) had low birth weight (LBW), 123 (7.7%) very low birth weight (VLBW) and 34 (2.1%) extremely low birth weight (ELBW). Most (92.8%) preterm babies were discharged. Prematurity had a case fatality rate (CFR) of 5.6%. Compared to normal birth weight infants, ELBW babies were 250 times and VLBW infants 47.6 times more likely to die.

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Conclusions*:* Incidence of preterm delivery in the Mother and Child Hospital, Akure was 15.4%. The CFR of prematurity was 5.6%. ELBW had the highest percentage of deaths (70.6%)

Introduction

Preterm birth constitutes a major strain on human and material resources in neonatal units as well as parental stress. Globally, 15 million babies are born too soon every year[1]. Regional variations range from 7.4% in Central and Eastern Asia to 13.3% in Southern Asia[1]. Prematurity complicates 12% of all deliveries in the United States of America[2]. In 2010, of births in Sub-Saharan Africa, 12.3% were preterm[1]. In Nigeria, 16% of newborns are low birth weight and 12% are born preterm[3,4].

Identified risk factors for preterm deliveries include fetal and maternal features as well as possible genetic predispositions[5-8]. Approximately 70% of preterm deliveries occur spontaneously (45% as a result of preterm labour and 25% from preterm premature rupture of membranes) while interventions for maternal or fetal problems account for the remaining 30%[9]. Malaria and other infectious diseases are particularly important in Africa[10-12]. Malaria-induced low birth weight is estimated to account for up to 360,000 infant deaths annually in Africa[13]. In a recent study in Niger Delta area of Nigeria, 57.1% of the pregnant women had malarial parasitaemia[14].

Survival of preterm babies has improved significantly with the advent of highly specialized intensive care but they still contribute to neonatal deaths in resource-limited settings[15-16]. Globally, 1.1 million infants die each year due to complications of preterm birth[1]. South Asia and sub-Saharan Africa account for more than 60% of the world's preterm babies and over 80% of global preterm deaths[1]. Hence, prematurity still contributes significantly to the high

infant and under five mortality rates in the region, despite some progress being made towards the Millennium Development Goals (MDG's). Nigeria is one of ten countries that contribute to two-thirds of all newborn deaths worldwide[17]. Neonatal deaths account for 33% of under-five mortality in Nigeria, and prematurity is a leading cause, constituting 32% of all neonatal deaths[4]. Based on southwestern Nigeria zonal data 2013, it was estimated that 6000 neonatal deaths occur annually in Ondo state with a neonatal mortality rate of 39 per 1000 live births, similar to the preceding decade[4,18].

Our facility was established by the Ondo state government to provide free health services to all under-five children and pregnant women as an Integrated Maternal, Newborn and Child Health (IMNCH) strategy to attain the MDGs[19]. This novel initiative is very impressive in resource-limited settings where out–of–pocket spending on health services, especially preterm care, can be catastrophic on affected household's income[20,21]. However, does neonatal outcome differ in this free health programme from previous reports in fee-paying health systems, elsewhere? Furthermore, to our knowledge, there is no prior work on burden of preterm deliveries in our state.

Objectives

To determine the incidence of preterm delivery in the Mother and Child Hospital (M & CH), Akure, to investigate the outcome and explore the relationship between birth weight and neonatal survival.

Method

The study was carried out at the M & CH, Akure. It is a busy, 100-bedded (60 obstetrics and 40 paediatric beds), ultra-modern public facility with a level II Neonatal Intensive Care Unit (NICU) providing specialized free and effective health care services to the state capital, allied communities and neighbouring states in the South-Western Nigeria and sometimes as far as the Northern and Southern parts of the nation in area of maternal and child health. Akure is the state capital of Ondo State, located in the south-west geo-political zone of Nigeria with land area of 15,000 square kilometres and has a long coastal line.

This is a cross-sectional observational survey. Ethical clearance was obtained from the Research and Ethical committee of the M & CH Akure and permission from the head of the Obstetrics department. Verbal consent was obtained from parents of the participants. Preterm birth was defined as delivery before 37 completed weeks of gestation[1]. When the date of the mother's last regular menstrual period (LRMP) was uncertain, gestational age was estimated using the Ballard score[22]. All preterm births from January 2013 to June 2014 were recruited into the study.

The demographic and clinical features (such as mode of delivery, gestational age, birth weight and outcome) of consecutive preterm births were documented in a patient log by a trained research assistant over the 18 month period. Preterm infants were classified based on their birth weights into low birth weight (<2,500g), very low birth weight (<1500g) and extremely low birth weight (<1000g) babies[23]. Discharge summaries and the departmental neonatal database were reviewed to ascertain the short-term outcome of the infants. The data collected were reviewed monthly at the Hospital General and Health Statistics Meeting, enhancing its accuracy. The total number of deliveries during the study period was determined from the hospital delivery register.

The data were analyzed using the Software Package for Social Science (SPSS) version 20.0 (Windows Inc; Chicago, IL, USA). Incidence of preterm delivery was computed using total births over the study period as the denominator. Birth weights were categorized and presented as proportions. Quarterly incidence of preterm births was presented graphically. Using univariate logistic regression, Odds ratio (OR) and 95% confidence interval (CI) were calculated for various birth weight categories as possible predictor of preterm death. P value *<0.05* was considered significant.

Results

The total births during the study period was 10,432 while total preterm births (<37 weeks) was 1,606, giving a preterm-delivery rate of 154 per 1,000 deliveries and a prevalence of 15.4%. Among the preterm infants, 1,449 (90.2%) were low birth weight (LBW), 123 (7.7%) were very low birth weight (VLBW) and 34 (2.1%) were extremely low birth weight (ELBW) babies. The quarterly incidence of prematurity fluctuated between 13% and 17% throughout the study period with the peaks being in the 1st and 3rd quarters of the year (Figure 1). However, extreme preterm births occurred most frequently in the last quarter of 2013 (n=7). The spectrum of outcome of the preterm infants is shown on Table 1.
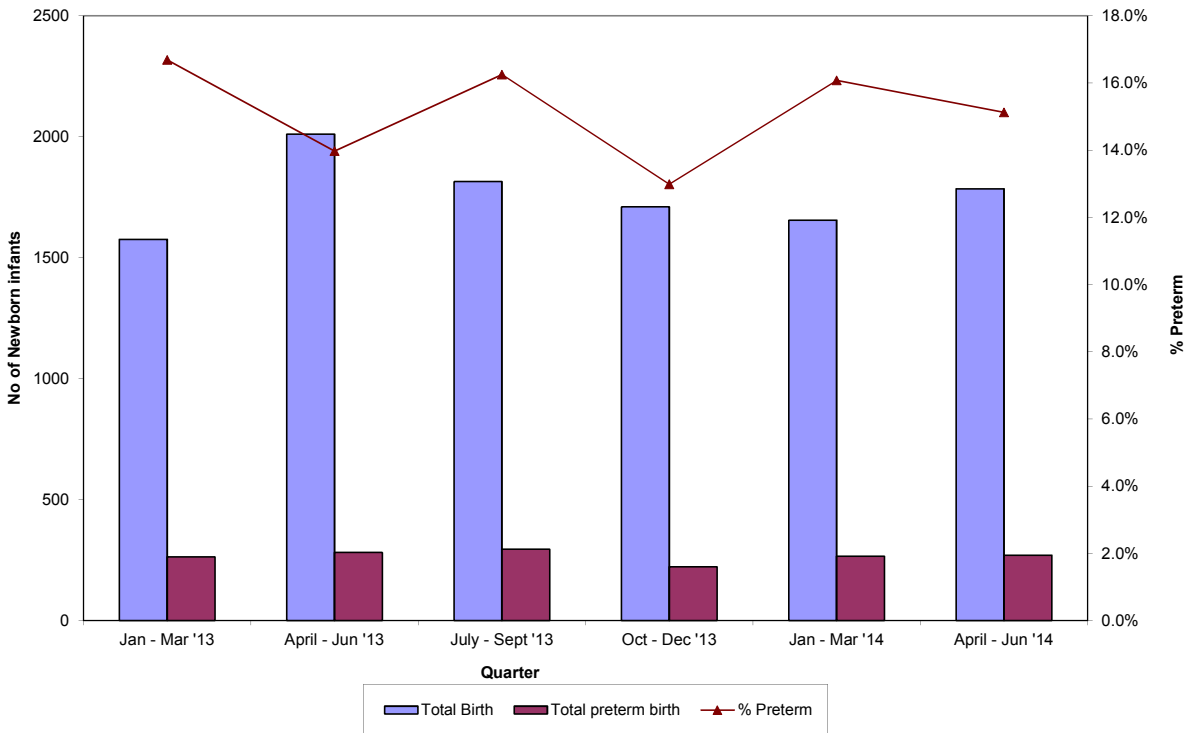
Figure 1: *Quarterly incidence of preterm births at M&CH Akure, January 2013-June 2014*
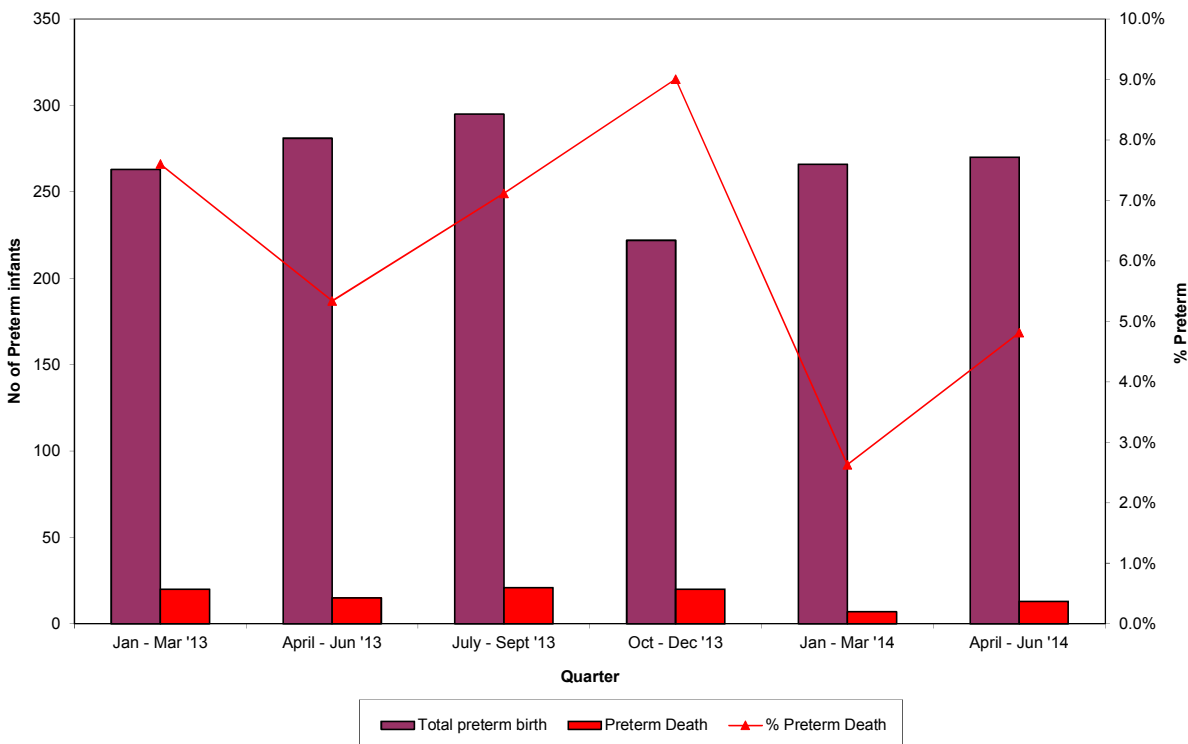
Table 1: Outcome of preterm infants by birth weight at M&CH Akure, January 2013-June 2014

Birth weight group	Total Number	Outcome			
		Discharge (%)	Death (%)	LAMA (%)	Referred (%)
ELBW (<1000g)	34	08 (23.5)	24 (70.6)	02 (05.9)	0 (0.0)
VLBW (*1000 to <1500g*)	123	80 (65.1)	39 (31.7)	02 (01.6)	02 (01.6)
*LBW (*1500 to <2500g*)	1,449	1,402 (96.7)	23 (01.6)	13 (0.9)	11 (0.8)
Total	1,606	1,490 (92.8)	86 (5.4)	17 (01.0)	13 (0.8)

*ELBW= extremely low birth weight; VLBW= very low birth weight; LBW= low birth weight; LAMA = leaving against medical advice; *All LBW infants who were term were excluded.*

Most (92.8%) of them were successfully managed and discharged. Altogether, prematurity has a case fatality rate (CFR) of 5.4% in this survey. Mortality reduces with increasing gestational age and birth weight, ranging from 70.6% in ELBW to 1.6% in LBW infants. The quarterly trend of preterm deaths is shown on Figure 2.

Figure 2: *Quarterly case fatality rate of prematurity at M&CH Akure, January 2013-June 2014*

Their mortality rate reduced from 7.5% in the first quarter of 2013 to 5.5% in the second quarter. Thereafter, it started to rise and peaked at 9.0% in the last quarter. It was 2.5% in early 2014 but doubled by mid-year. Univariate logistic regression analysis of birth weight as a predictor of preterm death is shown on Table 2.

Table 2: *Likelihood of death from prematurity by birth weight groups*

Birth weight	Regression coefficient	p-value	Odds ratio (OR)	95% CI for OR	
ELBW	-5.599	0.000	250.0	125	500
VLBW	-3.857	0.000	47.6	30.3	71.4
LBW	-0.808	0.000	2.2	1.5	3.4

ELBW= extremely low birth weight, VLBW= very low birth weight, LBW= low birth weight

Compared to normal birth weight infants, ELBW had the highest likelihood of death (250 times), VLBW infants were 47.6 times more likely to die while LBW had twice the death risk of a normal birth weight infant.

Discussion

This study confirmed a high incidence of preterm births (15.4%) in our setting, comparable to the prevalence of 18.5% obtained in Lagos by Oluwafemi *et al*[24] and 12% by Mokuola *et al*[25] in Illorin, all in south-western Nigeria. The slightly lower level found by Mokuola *et al*[25] may be due to the shorter duration of the study and their stricter inclusion criteria, precluding multiple gestations and major malformations. In contrast to our findings,

Kunle-Olowu *et al*[26] in Niger-Delta area of Nigeria and Onwuanaku *et al*[27] in North Central Nigeria reported that 24% and 31.3% of infants admitted in their facilities were preterm, respectively. Although the exact cause of this very high preterm delivery rate is unclear in the oil-polluted Niger-Delta, the latter study in northern Nigeria comprised only a laboratory-tested cohort, inadvertently introducing a selection bias[27]. Nonetheless, preterm birth rates differ across regions, for instance 7.4% in Eastern Asia and 13.2% in sub-Saharan Africa, possibly due to varied genetic and environmental predispositions to preterm births[28].

Fluctuation of the quarterly incidence of prematurity throughout this study period was considerable. It suggests the possible influence of changing extrinsic

factors. With the peaks coinciding with the wet season, the role of malaria in precipitating preterm labour is underscored, especially in our setting where adherence to preventive measures is suboptimal[13,19]. This highlights the need to intensify malaria control programme in endemic regions, alongside the Global Strategy for Women's and Children Health as well as other prematurity-related health initiatives[19].

The overall mortality rate of preterm infants in this study was 5.6%, but it differed widely among the sub-categories. Seven out of every ten extremely preterm infants died. This high mortality associated with extreme prematurity in the developing world has been shown over the decades by various researchers with limited improvement[29-31]. This is reflective of the slow pace of technological advancement in neonatal services in the region, coupled with the prohibitive cost of care, when available. The improved survival of our very preterm and moderately preterm in this study is partly ensured by the consistent use of standard practice guidelines including improvised nasal continuous positive airway pressure (CPAP), chlorhexidine ointment and kangaroo mother care in our unit[32-34].

Birth weight is a potent predictor of mortality among the preterm infants[27]. The highest case fatality rate of prematurity in this study occurred in October-December 2013 when the highest number of extremely low birth weight (ELBW) infants were born. Compared to normal birth weight (NBW) infants, ELBW infants are 250 times more likely to die, followed distantly by VLBW and LBW infants. Also, in 2007, Mathews TJ and MacDorman MF found a similar trend in the study of national infant mortality statistics in the USA[35]. Therefore, a major strategy in the reduction of neonatal deaths is to reduce the occurrence of preterm deliveries[36]. Moreover, considering both immediate and long-term prognosis, there is a need for extra ethical scrutiny of clinical decisions to resuscitate following deliveries at borderline viability, especially in medically-underserved regions.

Conclusions

- Incidence of preterm delivery in the Mother and Child Hospital, Akure was 15.4%.

- The case fatality rate of prematurity was 5.6% in this study.

- ELBW infants had the highest percentage of deaths (70.6%).

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