Original Article

Determinants of neonatal survival following preterm delivery at the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria

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ABSTRACT

Objective: To study the determinants of neonatal survival and outcome of preterm deliveries at the Department of Obstetrics and Gynaecology, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria.

Materials and Methods: A retrospective case-control study of women who had preterm delivery (PTD) at the UMTH, Maiduguri from January 1, 2014 to December 31, 2015 was conducted. Information on socio-demographic characteristics, antenatal care and treatment, Apgar score, Special Care Baby Unit (SCBU) and Statistical Package for Social Sciences (SPSS) admission and perinatal mortality were collated. Statistical analysis was done with SPSS. Odd ratio was used to test for association and multiple logistic regression was computed to control for confounding variables at 95% confidence interval.

Results: A total of 183 preterm births (with 195 babies) and 183 term births (with 184 babies) having complete information were analyzed. PTD occurred in 10.38% (19/183) of teenage mothers and 31.16% (68/183) of the PTD were before 32 weeks of gestation. Majority of the mothers have had at least basic education (63.69%). The mean duration of admission for the preterm babies was 1.9 + 8.4 days with neonatal survival and take home baby rate being 72.31% (141/195). Neonatal survival was independently associated with gestational age at delivery >32 weeks (OR = 12.24, CI: 5.67–34.76), antenatal dexamethasone (OR = 10.82, CI: 2.38–48.22), pre-labour premature rupture of membranes (OR = 7.68, CI: 1.83–34.64), and delivery after at least 24 hour of commencement of dexamethasone (OR = 5.66, CI: 1.23–45.23). However, maternal febrile illness (OR = 0.25, CI: 0.11–0.56) and polyhydramnious (OR = 0.29, CI: 0.16–0.55) adversely affected neonatal survival.

Conclusions: The neonatal survival following PTD is high. Survival is more likely in babies born after 32 weeks, PPROM, and after antenatal dexamethasone. We recommend routine use of antenatal dexamethasone injection in women at risk of PTD and planned delivery at the tertiary centre with equipments to cater for the special needs of the preterm babies.

Key words: Antenatal corticosteroids; determinants; gestational age; preterm delivery; pre-labour premature rupture of membranes; perinatal mortality.

Introduction

Preterm delivery (PTD) is the leading cause of perinatal morbidity and mortality worldwide with 1.1 million infant deaths due to complications of prematurity in 2010.[1] Developing countries including Nigeria contribute more than 60% of the world's preterm babies and over 80% of global preterm deaths.[1,2] The double misfortune of high PTD and low neonatal survival in these areas may be because of poor antenatal care, malaria, and other infectious causes

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of PTD[3–5] coupled with the lack of access to the expensive treatments such as surfactant needed by the preterm babies as well as poor neonatal intensive care facilities and drought of specialist to cater for the special needs of these babies.[2] Most of the preterm babies succumb to necrotizing enetrocolitis, sepsis, and respiratory problems.[6,7] Beyond the neonatal period, survivors have worse neural development, poor school performance, increased risk of cerebral palsy, and metabolic diseases in adulthood.[8–10]

In addition to good neonatal intensive care facilities, the survival of the preterm babies is inversely related to the gestational age at delivery and birth weight.[6,7,11] Recently, there is increasing advocacy on the use of antenatal steroid to hasten fetal lung maturity and improve neonatal survival particularly for women that are at risk of delivery before 34 weeks. Administration of corticosteroids to women at risk of PTD produce a considerable reduction in the risks of complications of prematurity such as combined fetal and neonatal death, respiratory distress syndrome, cerebroventricular hemorrhage, necrotizing enterocolitis, systemic infections, and childhood developmental delay.[12,13] Bethamethasone and dexamethasone have been shown by various workers to reduce perinatal morbidity and mortality for preterm babies.[12,13] In view of the above evidence, antenatal dexamethasone injections was enshrined in our department protocol for the management of PTD in 2013 but its effectiveness has not been reviewed in our hospital.

The antenatal steroid seems to be a viable option in our setting because of availability and ease of administration; however, this approach is hampered by the difficulty in identifying all women at risk of PTD.[14,15] In fact, many of the women present to the hospital when delivery is imminent. Other low technology modalities such as training community health workers in Kangaroo Mother Care (KMC), essential newborn care and special care of the moderately preterm baby will go a long way in reducing the perinatal mortality.[16] More so that preterm babies of African descend tend to be more matured at delivery than their Caucasian counterpart and are less likely to develop respiratory distress syndrome or require incubator.[8,17]

Earlier studies reviewed the risk factors for PTD with a view to modifying them and possibly improve the survival of the preterm babies; however, a study by Iyoke *et al*. in Enugu, Nigeria showed poor correlation between the maternal risk factors for PTD and perinatal survival.[18] Other researchers have found better perinatal survival of the preterm babies with increasing gestational age at delivery, higher birth weights as well as cesarean delivery than vaginal delivery.[2,19,20]

Knowledge of the factors that determines neonatal survival following PTD is vital in counselling women with preterm labour and also in preparations to optimize the survival for the preterm babies in our settings. To the best of our knowledge, no such study had been done in the North-Eastern Nigeria. We set out to study the determinants of the outcome of preterm births at the UMTH, Maiduguri.

Patients and Methods

A retrospective case-control study of women who had PTD at the … from January 1, 2014 to December 31, 2015 was carried out. The labour ward register, the Special Care Baby Unit (SCBU) register, and case records were used and for each PTD, and the next woman that delivered at term was recruited as control.

For the purpose of this study, PTD is delivery before 37 completed weeks, and gestational age was calculated from early scan or last menstrual period.

Information on sociodemographic characteristics, risk factors for PTD, use of dexamethasone, interval between commencement of dexamethasone and delivery, gestational age at delivery, mode of delivery, indication for delivery, Apgar score, SCBU admission, perinatal mortality, and take home baby rate were collated. The information was coded and transferred onto a profoma designed for the study. This was then transferred onto SPSS version 16 statistical software and analyzed. The socio-demographic characteristics, pregnancy complications, and birth outcomes are presented as percentages on frequency tables. Chi-square test and student's *t*-test were used to analyze for categorical variables and continuous variables, respectively. Multinomial logistic regression was used for multivariate analysis to construct a model for factors associated with neonatal survival. The statistical significance was set at $P < 0.05$.

Research and Ethics committee of the … granted approval for the study.

Results

There were 226 preterm deliveries and 43 had incomplete information and were excluded in the analysis. The remaining 183 preterm births (with 195 babies) were compared with 183 term births (with 184 babies). PTD occurred in 10.38% (19/183) of teenage mothers and 31.16% (68/183) of the PTD were before 32 weeks of gestation. Majority of the mothers have had at least basic education (63.69%) as shown in Table 1.

The mean duration of admission for the preterm babies was 1.9 + 8.4 days with neonatal survival and take home baby rate of 72.31% (141/195).

Table 1: Socio-demographic characteristics of women with preterm delivery (PTD)

Socio-demographic characteristics		
Age group		
<20	19	10.38
20-29	113	61.75
30-39	46	25.14
40 or more	5	2.73
Total	183	100
Parity		
0	68	31.16
1-4	87	47.54
5 or more	28	15.30
Total	183	100
Gestational Age at delivery		
<32 weeks	31	16.94
$32\text{-}33^{+6}$	96	52.46
$34\text{-}36^{+6}$	56	30.60
Total	183	100
Educational Levels		
No Basic Education	67	36.61
Basic Education	116	63.39
Total	183	100
Malpresentation		
Yes	11	6.01
No	180	93.9
Total	183	100

Table 2: Factors associated with neonatal survival after PTD

Factors associated with neonatal survival		
	Yes	**No**
Parity		
Nulliparity	40	4
Mutiparity	123	28
Total	163	32
χ^2=2.21, *P*=0.13 OR=1.23 (CI=0.35-3.96)		
Gestational Age at delivery		
>32 weeks	127	15
< 32 weeks	36	17
Total	163	32
χ^2=13.68, *P*=0.000, OR=4.66 (CI=1.87-9.11)		
PPROM		
Yes	44	5
No	119	27
Total	163	32
χ^2=5.65, *P*=0.017, OR=1.07 (CI=1.68-20.45)		
Febrile illness		
Yes	36	17
No	127	15
Total	163	32
χ^2=12.23, *P*=0.001, OR=0.25 (CI=0.11-0.56)		
Previous preterm delivery		
Yes	52	2
No	111	30
Total	163	32
χ^2=8.02, *P*=0.003 OR=6.59 (CI=1.51-28.11)		

Contd...

Table 2: Contd...

Factors associated with neonatal survival		
PIH		
Yes	51	7
No	112	25
Total	163	32
χ^2=0.77, *P*=0.30, OR=1.5 (CI=0.63-3.71)		
Antenatal Dexamethasone		
Yes	72	3
No	91	29
Total	163	32
χ^2=13.45, *P*=0.005, OR=10.47 (CI=2.31-43.78)		
Mode of delivery		
Vaginal delivery	116	27
Caesarean section	47	5
Total	163	32
χ^2=7.81, *P*=0.019, OR=4.78 (CI=0.67-13.56)		
Twin gestation		
Yes	9	3
No	154	29
Total	163	32
χ^2=0.69, *P*=0.405, OR=0.56 (CI=0.143-2.43)		
Polyhydramnious		
Yes	1	5
No	162	28
Total	163	32
χ^2=18.02, *P*=0003, OR=3.4 (CI=1.82-6.28)		
APH		
Yes	32	6
No	131	26
Total	163	32
χ^2=0.14, *P*=0.708, OR=1,22 (CI=0.43-3.45)		
HIV infection		
Yes	4	1
No	159	31
Total	163	32
χ^2=0.221, *P*=0.67, OR=0.58 (CI=0.28-5.67)		
Booking status		
Booked	103	17
Unbooked	60	15
Total	163	32
χ^2=1.07, *P*=0.30, OR=1.50 (CI=0.68-3.37)		
Sex		
Male	105	14
Female	58	18
Total	163	32
χ^2=1.44, *P*=0.441 OR=1.68 (CI=0.52-3.89)		
Birth interval		
<36 months	17	3
>36 months	79	16
Total	96	20
χ^2=0.17, *P*=0.87, OR=1.07 (CI=0.37-3.05)		

Table 2 showed the factors associated with neonatal survival following PTD. Neonatal survival was significantly associated with delivery at or beyond 32 weeks, pre-labour premature rupture of membranes (PPROM), previous PTD

and antenatal dexamethsone administration. Maternal peripartum febrile illness and polyhydramnious negatively affected neonatal survival, as shown in Table 2. Parity, pregnancy induced hypertension, mode of delivery, twin gestation, HIV infection, booking status, and neonatal sex had no statistically significant effect on neonatal survival.

Following multiple logistic regression analysis we found that neonatal survival was independently associated with Gestational age at delivery >32 weeks (OR = 12.24, CI: 5.67–34.76), antenatal dexamethasone (OR = 10.82, CI: 2.38–48.22), PPROM (OR = 7.68, CI: 1.83–34.64) and delivery after at least 24 hour of commencement of dexamethasone (OR = 5.66, CI: 1.23–45.23). However, maternal febrile illness (OR=0.25, CI:0.11-0.56) and polyhydramnious (OR=0.29, CI:0.16-0.55) adversely affected neonatal survival as shown in Table 3.

Discussion

PTD is a multi-faceted process, resulting from the interplay of factors causing the uterus to change from quiescence to active contraction, which leads to delivery before 37 completed weeks of gestation or purposely induced in the interest of the mother, fetus or both, anytime the risk of continuing the pregnancy outweigh the risk of delivery. In any case neonatal survival is an important consideration especially for the couple in guiding their decision.

Table 3: Multinomial logistic regression analysis model of factors associated with neonatal survival following PTD

Factors	Odd Ration (95% confidence interval)	*P*
Gestational age at delivery		
>32 weeks	12.24 (5.67-34.76)	0.004
<32 weeks	-	
Antenatal Dexamethasone		
Yes	10.82 (2.38-48.22)	0.002
No	-	
Time interval of steroid		
>24 hours	5.66 (1.23-45.23)	0.005
<24 hours	-	
PROM		
Yes	7.68 (1.83-34.64)	0.021
No	-	
Mode of delivery		
Cesarean Section	2.23 (0.63-7.67)	0.27
Vaginal delivery	-	
Maternal pyrexia		
Normal	2.37 (0.78 -6.71)	0.094
Febrile	-	
Twin gestation		
Yes	1.01 (0.18-5.81)	0.85
No	-	
Birth Interval		
>36 months	0.74 (0.15-3.77)	0.79
<36 months	-	

Our neonatal survival rate of 72.31% after PTD is higher than the 65.5% earlier reported in the same centre by Ambe *et al*. in 2007. This improvement can be attributed to the use of antenatal dexamethasone during the period under review in patients at risk of PTD. It is hoped that with the regular use of antenatal corticosteroid we will record better survival in the future. Our neonatal survival higher than the 65.9% recorded in Akure[6] but similar to the 69.9% recorded in Sokoto,[7] Nigeria. Both studies did not report the use of antenatal corticosteroids.

Neonatal survival is said to be rare before the age of 24 weeks and exceeds 90% for preterm infants of more than 29 weeks in the developed countries.[21,22] However, it is very difficult to assign a cut off weeks for neonatal survival in our environment but our finding showed that babies delivered after 32 weeks are 12 times more likely to survive than babies delivered before then. The improved survival with increasing gestational age at delivery is not surprising because the neonate vital organ's functionality improves progressively with increasing gestational age till 40 weeks in some cases.[23]

PPROM is a known risk factor for PTD, and in keeping with our finding a recent study by Tsafrir *et al*., found a better neonatal outcome in babies born preterm following PPROM compared those delivered without PPROM at the same gestational age.[24] It has been postulated that PPROM puts undue stress on the mother and stressed pregnancies have been associated with accelerated fetal lung maturity due to increased maternal glucocorticoid levels.[25,26] Hence, the conclusion by Tsafrir *et al*. that women with PPROM after 32 weeks should be delivered without undue delays in order to reduce the risk of chorioamnionitis.[24] The association of PPROM with neonatal survival should be taken with caution because some studies have found that 25% of PTD are associated with intrauterine infection and the risk is more in cases with PPROM. Gonclaves *et al*. found positive cultures in 32.4% of PTD complicated by PPROM, which further exposes the neonate to neonatal sepsis that could jeopardize neonatal survival.[27] Other maternal infections including urinary tract infections, malaria, bacterial vaginosis, HIV, and syphilis are all associated with increased risk of preterm birth and poor neonatal outcome.[28] This could explain why peripartum fever was found to be associated with poorer neonatal outcome in our study and most of the febrile mother tested positive for malaria (not shown in the result). A high prevalence of both maternal and placental malaria of 30.7% and 33.9%, respectively, has been observed earlier in the same centre and the placental malaria has been linked to both PTD and low birth weight.[29]

We found previous PTD to be associated with better neonatal survival and our finding contrast with that of Whiteman *et al*. who found previous PTD to be associated with increased risk of neonatal death in subsequent delivery.[30] They argued that the risk of subsequent neonatal death may be because of worsening prematurity in the subsequent pregnancies and it could be a recurrent problem. However, our finding of improved survival may be related to the women seeking for better neonatal care in their subsequent pregnancies particularly in a tertiary health facility where we conducted our study. Certainly, a well equipped SCBU will improve neonatal survival and majority of these facilities in the developing countries are located in the tertiary health centres.

Respiratory distress syndrome (RDS) is a common condition in premature babies that can lead to mortality[6,7,11,31] and a review by Hofmeyr[12] showed that fetal lung maturity can be aided by antenatal corticosteroids leading better neonatal survival. Our study also confirmed this assertion and showed that antenatal dexamethasone is associated independently with neonatal survival. This finding is important for a developing country like ours where SCBU facility like the use of surfactant is either not available or very expensive. Dexamethasone is cheap and readily available and with the above evidence its utilisation can be encouraged even in the primary health care facilities upon diagnoses of impending PTD pending referral to the tertiary centres for delivery.

Furthermore, the benefit of antenatal dexamethasone is seen even in infants born less than 24 hours after administration of the first dose[12,32] and this was also seen in our study. We found preterm babies delivered 24 hours after commencement of the injections to be five times more likely to survive than those delivered earlier.

Dexamethasone is not without its untoward effect on the neonates as there are reports of hypoglycemia amongst exposed neonates.[13,32] This calls for vigilance after delivery in order to detect and treat such babies.

Conclusion

The neonatal survival following PTD is 72.31%. Survival is more likely in babies born after 32 weeks, PPROM, and at least 24 hours after antenatal dexamethasone injections. Maternal febrile illness and polyhydramnios threatened neonatal survival. We recommend routine use of dexamethasone in pregnancies at risk of PTD and planned delivery at the tertiary centre with equipments to cater for the special needs of the preterm babies.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Blencowe H, Cousens S, Oestergaard M, Chou D, Moller AB, Narwal R, *et al*. National, regional and worldwide estimates of preterm birthrates in the year 2010 with time trends since 1990 for selected countries: A systematic analysis and implications. The Lancet 2012;379:2162-72.
2. Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller A, *et al*. Born Too Soon: The global epidemiology of 15 million preterm births. Reprod Health 2013;10:S2.
3. Huang A, Jin X, Liu X, Gao S. A matched case–control study of preterm birth in one hospital in Beijing, China. Reprod Health 2015;12:1.
4. Omole-Ohonsi A, Attah RA. Risk Factors of Preterm Deliveries at Aminu Kano Teaching Hospital, Kano, Nigeria. Bangladesh J Obstet Gynaecol 2014;29:9-14.
5. Oliver RS, Lamont RF. Infection and antibiotics in the aetiology, prediction and prevention of preterm birth. J Obstet Gynaecol 2013;33:768-75.
6. Kunle-Olowu OE, Peterside O, Adeyemi OO. Prevalence and Outcome of Preterm Admissions at the Neonatal Unit of a Tertiary Health Centre in Southern Nigeria. Open Journal of Pediatrics 2014;4:67-75.
7. Onankpa BO, Isezuo K. Pattern of preterm delivery and their outcome in a tertiary hospital. Int J Health Sci Res 2014;4:59-65.
8. Steer P. The epidemiology of preterm labour. BJOG 2005;112:1-3.
9. Quigley MA, Poulsen G, Boyle E, Wolke D, Field D, Alfirevic Z, *et al*. Early term and late preterm birth are associated with poorer school performance at age 5 years: A cohort study. Arch Dis Child Fetal Neonatal Ed 2012;97:167-73.
10. Woythaler MA, McCormick MC, Smith VC. Late preterm infants have worse 24-month neurodevelopmental outcomes than term infants. Pediatrics 2011;127:e622-9.
11. Oluwafemi RO, Abiodun MT. Incidence and outcome of preterm deliveries in Mother and Child Hospital, Akure, Southwestern Nigeria. SriLanka Journal of Child Health 2016;45:11-7.
12. Hofmeyr GJ. Antenatal corticosteroids for women at risk of preterm birth: RHL commentary (last revised: 2 February 2009). The WHO Reproductive Health Library; Geneva: World Health Organization.
13. ACOG Committee on Obstetric Practice. ACOG Committee Opinion No. 475: Antenatal corticosteroid therapy for fetal maturation. Obstet Gynecol 2011;117:422-4.
14. Slattery MM, Geary M, Morrison JJ. Obstetric antecedents for preterm delivery. J Perinat Med 2008;36:306-9.
15. Akintayo AA, Awoleke JO, Ogundare EO, Olatunya OS, Aduloju OP. Preterm births in a resource constrained setting: Sociobiologic risk factors and perinatal out comes. Ghana Med J 2015;49:251-7.
16. Lawn JE, Davidge R, Paul VK, von Xylander S, de Graft Johnson J, Costello A, *et al*. Born Too Soon: Care for the preterm baby. Reprod Health 2013;10:S5.
17. Alexander GR, Kogan M, Bader D, Carlo W, Allen M, Mor J. US birth weight/gestational age-specifi c neonatal mortality: 1995-1997 rates for whites, hispanics, and blacks. Pediatrics 2003;111:e61-6.
18. Iyoke CA, Lawani LO, Ezugwu EC, Ilo KK, Ilechukwu GC, Asinobi IN. Maternal risk factors for singleton preterm births and survival at the University of Nigeria Teaching Hospital, Enugu, Nigeria. Niger J Clin Pract 2015;18:744-50.
19. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, *et al*. The worldwide incidence of preterm birth: A systematic review of maternal mortality and morbidity. Bull World Health Organ 2010;88:31-8.
20. Oloyede OA. Specialized antenatal clinics for women with a pregnancy

at high risk of preterm birth (excluding multiple pregnancy) to improve maternal and infant outcomes: RHL commentary. In: The WHO Reproductive Health Library. Geneva: World Health Organisation; 2012.

21. Larroque B, Breart G, Kaminski M, Dehan M, Andre M, Burguet A, *et al*. Survival of very preterm infants: Epipage, a population based cohort study. Arch Dis Child Fetal Neonatal Ed 2004;89:F139-44.
22. Costeloe KL, Hennessy EM, Haider S, Stacey F, Marlow N, Draper ES. Short term outcomes after extreme preterm birth in England: Comparison of two birth cohorts in 1995 and 2006 (the EPICure studies). BMJ 2012;345:e7976.
23. American College of Obsterticians and Gynaecologist. ACOG Committee Opinion No. 560: Medically indicated late-preterm and early-term deliveries. Obstet Gyneacol 2013;121:908-10.
24. Tsafrir Z, Margolis G, Cohen Y, Cohen A, Laskov I, Levin I, *et al*. Conservative management of preterm premature rupture of membranes beyond 32 weeks ' gestation: Is it worthwhile? J Obstet Gynecol 2015;35:585-90.
25. Amiel-Tison C, Cabrol D, Denver R, Jarreau P, Papiernik E, Piazza PV. Fetal adaptation to stress Part I: Acceleration of fetal maturation and earlier birth triggered by placental insufficiency in humans. Early Hum Dev 2004;78:15-27.
26. Chen Y. Blood Levels of Maternal Serum Corticotropin-releasing Hormone (CRH) at Mid Pregnancy: Which maternal characteristics are influential? Msc Epidemiology Thesis, Submitted to Michigan State University in Partial Fulfilment of requirement for degree Masters of Scinnece Epidemiology, 2008. UMI Number: 1468314.
27. Goncalves LF, Chaiworapongsa T, Romero R. Intrauterine infection and prematurity. Ment Retard Dev Disabil Res Rev 2002;8:3-13.
28. Gravett MG, Rubens CE, Nunes TM. Global report on preterm birth and stillbirth (2 of 7): Discovery science. BMC Pregnancy Childbirth 2010;10:S2.
29. Bako BG, Audu BM, Geidam AD, Kullima AA, Ashiru GM, Malah MB, *et al*. Prevalence, risk factors and effects of placental malaria in the UMTH, Maiduguri, North-eastern, Nigeria: A cross-sectional study. J Obstet Gynaecol 2009;29:4,307-10.
30. Whiteman VE, August EM, Mogos M, Naik E, Garba M, Sanchez E, *et al*. Preterm birth in the first pregnancy and risk of neonatal death in the second pregnancy: A propensity score-weighted matching approach. J Obstet Gynaecol 2015;35:30-6.
31. Ambe JP, Idrisa A, Usman JD. A review of preterm admissions into special care baby unit, in University of Maiduguri Teaching Hospital: A four year experience. Niger J of Clin Pract 2007;10:229-33.
32. American College of Obsterticians and Gynaecologist. ACOG Committee Opinion No. 667: Antenatal corticosteroid therapy for fetal maturation. Obstet Gynecol 2016;128:e187-94.