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Annals of Pediatrics & Child Health

Research Article

# Prevalence, Risk Factors, and Hospital Outcome of Preterm Births in a Regional Hospital in Cameroon

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**Submitted:** 18 March 2022

**Accepted:** 12 April 2022

**Published:** 15 April 2022

**ISSN:** 2373-9312



**Keywords**

- Preterm birth
- Risk factors
- Outcomes
- Preterm delivery

**Abstract**

**Background:** Prematurity is an important cause of neonatal mortality, and is defined as a delivery of a live neonate before 37 completed weeks of pregnancy.

**Aim:** To assess the prevalence, risk factors and outcomes of preterm birth at the neonatology unit of the Bamenda Regional Hospital (BRH).

**Methods:** This was a 4-years retrospective case-control study carried out from January 2016 to December 2019, including 365 preterm neonates and 365 matched term neonates. Binary logistic regression followed by multivariate logistic regression analysis were used to identify independent risk factors of prematurity.

**Results:** The incidence of preterm birth was 18.5%. Multivariate analysis demonstrated that maternal primary and secondary education [Adjusted Odds ratio (AOR) 2.857 95%CI (1.120 – 7.487), 0.034], preterm premature rupture of membranes (PPROM) [AOR 2.737 95% CI (1.133 – 6.611), 0.025], and multiple pregnancy [AOR 4.772 95%CI (2.413 – 9.428), 0.000] were independent predictors of prematurity. Of the 365 preterm neonates included in the study, 39 (10.7%) died in the hospital. The major causes of death were apnoea (65%), neonatal infection (12.5%), and respiratory distress (12.5%).

**Conclusions:** Preterm birth is still unacceptably high in the Bamenda Regional Hospital. Prevention in risk groups can go a long way to reduce this prevalence and associated morbidity.

## INTRODUCTION

Preterm birth is defined as babies born alive before 37 completed weeks of pregnancy [1]. Preterm birth is a major clinical problem associated with significant mortality and morbidity [1-3]. An estimated 15 million babies are born too early every year and this rate is increasing in almost all countries [2,4-6]. It is the leading cause of death in children under the age of 5years [1,3,7]. Globally, it is estimated that 1.1 million neonatal deaths occur annually due to preterm birth complications with 80% of these occurring in Asia and sub-Saharan Africa [1,6]. This study had as aim to determine the incidence, identify the risk factors, and the outcome of preterm babies in the Bamenda Regional Hospital (BRH), in the North West Region of Cameroon.

## METHODS

### Study design and period

We conducted a four-year retrospective case – control study over a period of three months from March 1st to May 31th, 2020. Our study involved all neonates hospitalized at the Neonatology Unit of the Bamenda Regional Hospital, from January 1st, 2016 to December 31th, 2019.

### Study setting

This study was conducted at the Neonatology Unit of the BRH. The BRH is situated in the Bamenda II Subdivision in Mezam Division in the Northwest Region of Cameroon. The Neonatology Unit is made up of outpatient consultation and the neonatal ward. The unit also has a kangaroo ward where preterm children are followed up and monitored by doctors for proper growth. The unit has three medical doctors (1 Paediatrician and 2 General Practitioners), and 11 nurses. The Neonatal ward has 14 functional incubators, 30 cots and 16 beds.

### Patient selection

The files of all neonates hospitalized at the BRH during the study period were identified from the admission registers. Information from each neonate's file, were extracted onto a

pre-tested questionnaire designed for this purpose. Each file of a preterm neonate examined was followed by a corresponding term neonate's file. The files of the preterm neonates (every life new-born born at less than 37 gestational weeks), constituted the case group while term neonates (every life new-born born at greater than or equal to 37 gestational weeks), constituted the control group. The case/control ratio was 1:1. Information on maternal sociodemographic characteristics, obstetrical history, prenatal, perinatal, and postnatal data and admission in the Neonatology Unit were collected from the files. Every nonviable new-born and those with incomplete files were not retained for this study.

### Data management and statistical analysis

Data was entered and analysed using SPSS for windows version 26.0. Qualitative variables were reported as counts and proportions while quantitative variables were summarized as means and medians with their corresponding standard deviations (SD), and interquartile ranges (IQR) respectively. The Fisher's exact test or Chi-squared test were used to compare categorical variables. After bivariate logistic regression analysis, all variables with a *p*-value less than 0.05 underwent multivariate analysis with logistic regression, to identify independent risk factors of preterm birth.

### Ethics

Ethical clearance was obtained from the ethical committee of the Faculty of Health Sciences, of the University of Bamenda, and administrative authorization from the Regional Delegate of Public Health for the North West Region, Bamenda, and the Director of the Bamenda Regional Hospital. The Institutional Review Board of the University of Bamenda approved this study (No. 2020/0026H/UBa/IRB).

## RESULTS

Four thousand one hundred and seventeen neonates were hospitalized at the Neonatology Unit of the BRH during the study period among which 762 were preterm neonates giving a proportion of 18.5%. The prevalence of preterm birth dropped from 17.7% in 2016 to 16.51% in 2017 and rose again to 24.04% in 2018, and finally dropped to 15.81% in 2019.

Of the 762 preterm neonates, we found 568 files, excluded 203 files, which were incomplete, and retained 365 files, that met our inclusion criteria. We matched these files with files of 365 term neonates giving a case to control ratio of 1:1.

### Characteristics of the preterm neonates

Most of the preterm neonates, 198 (53.4%), were males. The majority of preterm neonates, 269(73.7%), had a birth weight between 1500 to 2499g, while 14 (3.9%), had birth weights greater than or equals to 2500g, and finally 82 (22.4%), had birth weights less than 1500g. Most of the preterm neonates, 236 (64.6%), were born between 33 – 36 weeks gestational age, 124 (34.2%), were born between 28 – 32 weeks, while 5 (1.37%), were born at less than 28 weeks of gestation.

### Maternal sociodemographic characteristics

The majority of the preterm neonates, 32(68.1%), were from mothers in the age group 20 – 34 years, 33 (84.6%), were from married mothers, 24 (61.5%), were from mothers working in the informal sector, 14(51.9%), of the mothers had attended at least up to secondary school, and 237(64.9%), of the mothers lived in urban areas.

Maternal age less than 20years [OR=5.05; CI 95 (1.277 – 20.0); *P*=0.021] and having a level of education less than secondary school [OR=4.090; C.I.95 (1.243 - 10.67); *P*=0.018] were risk factors of preterm birth. The protective factors were a maternal age group of 20 – 34 years [OR=0.592; CI 95 (0.206 – 18.6); *P*=0.026] and living in an urban area [OR=0.588; C.I.95 (0.426 – 0.812); *P*=0.001] (**Table 1**).

### Maternal obstetrics characteristics

Most of the mothers of the preterm neonates, 79 (50.6%), were multiparous, 193 (97.5%), had been followed up for their pregnancies; 33(50.8%), were followed up at the Bamenda Regional Hospital, and 356 (98.1%), of the mothers had a negative HIV serology. Attending less than four antenatal consultations (ANC) was a risk factor for preterm birth [OR=3.144; CI 95 (1.871 – 5.234); *P*=0.000] (**Table 2**).

### Maternal pathologies associated with preterm birth

Among the maternal pathologies studied: preeclampsia [OR=6.234; C.I.95 (2.132 – 18.251), *P*=0.000], placenta previa [OR=6.321; C.I.95(3.211–14.251); *P*=0.000], premature/ prolonged rupture of membranes[OR=17.23; C.I.95(2.315–133.62); *P*=0.000], malaria in pregnancy [OR=4.213; C.I.95(2.321–8.255); *P*=0.000], and urogenital infections [OR=4.123 ;CI 95 (1.233– 14.23); *P*=0.033] were all risk factors associated with preterm delivery **(Table 3).**

### Foetal risk factors of preterm birth

The majority of preterm births, 192(52.6%), were from singleton gestation, while 5(1.4%) had congenital malformations. Multiple pregnancy was a risk factor for prematurity [OR=9.708; CI 95 (6.341 – 14.724); P=0.0001] **(Table 4).**

Multivariate analysis of the factors statistically significant on bivariate analysis showed that a level of education less than the secondary level [AOR=2.857; CI 95 (1.120-7.487); *P*=0.034], prolonged rupture of membranes [AOR=2.737; CI 95(1.133-6,611); *P*=0.025], and multiple pregnancies [AOR=4.772; CI 95 (2.415-9,428); *P*=0.000] were independent risk factors for preterm birth.

### Hospital outcome

The majority of preterm neonates, 326(89.3%), had a favourable evolution in the hospital. We noted that, 314(86.0%), preterm babies were discharged alive from the hospital, while 39(10.7%), died during hospitalization, 9 (2.5%), were discharged against medical advice and 3 (0.8%), were referred to other hospitals. Most preterm neonates, 28 (71.8%), died during the early neonatal period (0 – 7 days). Most preterm neonatal deaths, 26(65%), were due to apnoea of prematurity, while 5(12.5%), were due to neonatal infection, 5(12.5%) were due to respiratory distress, 2(5%), were due to anaemia, and 2(5%), were due to necrotizing enterocolitis. Most of the preterm neonates, 142 (38.9%), stayed in the hospital for a duration of

**Table 1:** Maternal sociodemographic characteristics.

| | Gestational age categories | | OR (95% CI) | P value |
|---|---|---|---|---|
| | **Premature n/N(%) n=365** | **Term n'/N (%) n=365** | | |
| **Maternal age** | | | | |
| <20 | 9/12 (19.1) | 3/12 (4.8) | 5.05 (1.277 – 20.0) | **0.021** |
| 20 – 34 | 32/86(68.1) | 54/86(86) | 0.592 (0.206 – 18.6) | **0.026** |
| ≥35 | 6/12 (12.8) | 6/12 (9,5) | 1.000 (0.501 –5.681) | 0.392 |
| **Marital status** | | | | |
| Single | 6/19 (15.4) | 13/19 (25.5) | 0.53 (0.18- 1.56) | 0.303 |
| Married | 33/71 (84.6) | 38/71(74.5) | | |
| **Occupation** | | | | |
| Civil servant | 4/15 (10.3) | 11/15(21.6) | 0.357(0.112 – 1.130) | 0.08 |
| Private sector | 3/5 (7.7) | 2/5 (3.9) | 0.242 (0.029 – 2.027) | 0.191 |
| Informal sector | 24/45 (61.5) | 21/45(41.2) | 0.318 (0.088 – 1.151) | 0.081 |
| Student | 8/25 (20.5) | 17/25(33.3) | 0.773 (0.187 – 3.196) | 0.722 |
| **Level of education** | | | | |
| Primary & Secondary | 14/23(51.9) | 9/23 (23.1) | 4.090 (1.243 - 10.67) | **0.018** |
| Superior level | 13/43 (48.1) | 30/43 (76.9) | 0.279(0.096 – 0.805) | **0.018** |
| **Residence** | | | | |
| Urban area | 237/514 (64.9) | 277/514 (75.9) | 0.588 (0.426 – 0.812) | **0.001** |
| Rural area | 128/216 (35.1) | 88/216 (24.1) | | |

**Table 2:** Maternal obstetrical characteristics.

| | Gestational age categories | | OR (95% CI) | P value |
|---|---|---|---|---|
| | **Premature n/N(%) n=365** | **Term n'/N (%) n=365** | | |
| **Parity** | | | | |
| Primipara | 54/114(34.6) | 60/114(37.3) | 0.891(0.096 – 0.563) | 0.623 |
| Multipara | 79/167(50.6) | 88/167(54.7) | 0.992 (0.712 – 1.421) | 0.992 |
| Grand multipara | 23/36(14.7) | 13/36(8.1) | 1.923(0.899 - 4.892) | 0.087 |
| **Pregnancy followed Up** | | | | |
| Yes | 192/315(97.5) | 123/315(97.6) | 0.937 (0.220 -3.989) | 0.929 |
| No | 5/8 (2.5) | 3/8 (2.4) | | |
| **Number of ANC*** | | | | |
| 0 | 5/8 (3.3) | 3/8 (2.7) | 1.216(0.285 – 5.199) | 0.792 |
| 1 – 3 | 81/111(52.9) | 30/111(27.0) | 3.144(1.871 – 5.234) | **0.000** |
| ≥4 | 67/145(43.8) | 78/145(70.3) | 0.330(0.196 – 0.553) | **0.000** |
| **Place of follow up** | | | | |
| BRH† | 13/20(20.0) | 7/20(14.0) | 1.536(0.563 – 4.190) | 0.401 |
| Other hospital | 33/63(50.8) | 30/63(60.0) | 0.592 (0.1876 – 5.32) | 0.325 |
| Health center | 19/32(29.2) | 13/32(26.0) | 0.786(0.119 – 3.254) | 0.685 |
| **HIV Status** | | | | |
| Positive | 7/10(1.9) | 3/10(0.8) | 2.373(0.609 – 9.243) | 0.213 |
| Negative | 356/718(98.1) | 362/718(99.2) | | |

ANC*Antenatal care BRH†Bamenda Regional Hospital

**Table 3:** Maternal pathologies associated with prematurity.

| PATHOLOGIES | | Gestational age categories | | Total | OR (95% CI) | P value |
|---|---|---|---|---|---|---|
| | | PRETERM n/N(%) | TERM N' /N(%) | | | |
| Diabetes | YES | 2/2(0.5) | 0/2(0.0) | 2(0.3) | -- | -- |
| | NO | 363/728(99.5) | 365/728(100.0) | 728(99.7) | | |
| Respiratory disease | YES | ½(0.3) | ½(0.3) | 2(0.3) | 1.000 | 1.000 |
| | NO | 364/728(99.7) | 364/728(99.7) | 728(99.7) | | |
| Chronic high blood pressure | YES | 3/3(0.8) | 0/3(0.0) | 3(0.4) | -- | -- |
| | NO | 362/728(99.2) | 365/727(100.0) | 727(99.6) | | |
| Heart disease | NO | 365(100.0) | 365(100.0) | 730(100.0) | -- | -- |
| Eclampsia | YES | 1/3(0.3) | 2/3(0.5) | 3(0.4) | 0.499 (0.043 – 5.266) | 0.563 |
| | NO | 364/723(99.7) | 363(99.5) | 727(99.6) | | |
| Pregnancy induced HTN (Pre-eclampsia) | YES | 24/28(6.6) | 4/24(1.1) | 28(3.8) | 6.234 (2.132 – 18.251) | **0.000** |
| | NO | 341/702(93.4) | 361/702(98.9) | 702(96.2) | | |
| Prolonged rupture of membranes | YES | 48/56(13.2) | 8/56(2.2) | 56(7.7) | 6.321 (3.211 – 14.251) | **0.000** |
| | NO | 317/674(86.8) | 357/674(97.8) | 674(92.3) | | |
| Placenta previa | YES | 17/18(4.7) | 1/18(0.3) | 18(2.5) | 17.23 (2.315 – 133.62) | **0.000** |
| | NO | 348/711(95.3) | 363/711(99.7) | 711(97.5) | | |
| Placenta abruption | YES | 9/9(2.5) | 0/9(0.0) | 9(1.2) | -- | 0.004 |
| | NO | 356/721(97.5) | 365/721(100.0) | 721(98.8) | | |
| Malaria | YES | 52/65(14.2) | 13/65(3.6) | 65(8.9) | 4.213 (2.321 – 8.255) | **0.000** |
| | NO | 313/665(85.8) | 352/665(96.4) | 665(91.1) | | |
| Toxoplasmosis | YES | 6/6(1.6) | 0/6(0.0) | 6(0.8) | -- | 0.031 |
| | NO | 359/724(98.4) | 365/724(100.0) | 724(99.2) | | |
| Syphilis | YES | 3/3(0.8) | 0/3(0.0) | 3(0.4) | -- | 0.249 |
| | NO | 362/727(99.2) | 365/727(100) | 727(99.6) | | |
| Urogenital infection | YES | 12/15(3.3) | 3/15(0.8) | 15(2.1) | 4.123 (1.233 – 14.23) | **0.033** |
| | NO | 353/715(96.7) | 362/715(99.2) | 715(97.9) | | |

HTN*Hypertension

**Table 4:** Foetal factors associated with prematurity.

| PATHOLOGIES | | Gestational age categories | | Total | OR (95% CI) | P value |
|---|---|---|---|---|---|---|
| | | PRETERM n/N(%) | TERM N' /N(%) | | | |
| **FOETAL** | | | | | | |
| Multiple pregnancy | YES | 173/204(47.4) | 31/204 (8.5) | 204 (27.9) | 9.708 (6.341 – 14.724) | **0.0001** |
| | NO | 192/526(52.6) | 334/526(91.5) | 526 (72.1) | | |
| Congenital malformations | YES | 5/13 (1.4) | 8/13 (2.2) | 13 (1.8) | 0.602 (0.201 – 1.913) | 0.405 |
| | NO | 360/717(98.6) | 357/717(97.8) | 717 98.2) | | |

0 – 10 days, while 121(33.2%), were hospitalized for a period of 11 – 20 days and 102 (27.9%) were in the hospital for more than 20 days.

## DISCUSSION

The prevalence of prematurity in this study was 18.5%. This is similar to the prevalence of 18.3% obtained in Kenya in 2018 [8], 16.9% and 16.8% obtained in Nigeria in 2014 [3], and 2016 [9], respectively. Similar study designs, study settings and study subjects can explain the reason of these similarities.

This prevalence was higher than the 12% and 9% reported in 2017 for both low- and high-income countries respectively [10]. It was also higher than the findings of other studies carried out in Africa: 12% in Senegal in 2005 [11], 9.3% in Ghana in 2006 [12], 11.8% in Nigeria in 2010 [13], 13.3% in Ethiopia in 2019 [14], and 13.8% in South Africa in 2019 [15]. Our prevalence was higher than the prevalence found in other parts of the world;12% and 11.1% for both black and white women respectively in USA

in 2004 [16], 2.4% and 5.1% in Iran in 2012 [17], and 2014 [18], respectively, 13.1% and 11.5% in Brazil in 2004 [19], and 2016 [20], respectively. These differences could be due to different study designs, settings, as well as inclusion and exclusion criteria, and the quality of healthcare provided.

This prevalence was lower than that reported in the Yaounde Gyneco – Obstetrics and Pediatrics Hospital (YGOPH) in 2013 of 26.6% [21]. This difference, despite the fact that both studies have the same study design and study setting, could be because the YGOPH is one of the main mother and child referral centres in Cameroon. Moreover, the authors did a nine years retrospective case – control study while we did a four years retrospective case – control study. Our prevalence was also lower than 28.1% reported in 2018 in Senegal [22]. The difference here may be because both studies have different study designs, and the study in Senegal was conducted in a tertiary referral centre that received cases from other hospitals around the country.

Mothers who were still attending primary and secondary school were almost three times more likely to give birth to preterm babies than those of higher level of education. Our findings are similar to those of studies done in 2017 in Italy [23], in the United Kingdom in 2015 [24], and Balochistan in 2017 [10]. The possible explanation is that most secondary school girls are often psychologically stressed up during pregnancy and lack the care needed during pregnancy and this can lead to preterm delivery. Moreover, the lack of knowledge and experience on pregnancy can contribute to preterm birth. However, a study conducted in the USA in 2012 reported that secondary education is a protective factor of preterm birth while tertiary education is a risk factor [25]. Other authors did not have a statistical significant association between preterm birth and maternal education [8,20,21].

In this study, preterm premature rupture of membranes (PPROM) was an independent predictor of preterm birth. Other authors reported similar findings but to different extends [8,11,18,20]. PPROM causes the release of inflammatory cytokines like prostaglandins, interleukins 6 and tumour necrosis factor (TNF), that stimulate and initiate contractions of the uterine smooth muscles hence leading to preterm birth [8,9,11,26]. The study in the YGOPH found no statistical significant association between PPROM and preterm birth [21].

In this study, mothers who had multiple gestations were about five times more likely to deliver preterm babies than those that had singleton pregnancies. This is consistent with studies done in Yaounde, Cameroon in 2013 [21], Kenya in 2018 [8], Nigeria in 2010 [13], Ethiopia in 2018 [14], Senegal in 2004 [11], Iran in 2014 [18], and Brazil in 2016 [20]. Multiple gestation leads to over-distension of the uterus and up-regulation of oxytocin receptors and initiation of contractions leading to preterm labour and premature delivery [18,26,27]. Moreover, over-distension of the uterus leads to stretch of membranes that result in the release of prostaglandins that initiate preterm labour that can lead to preterm delivery [14].

The neonatal mortality rate of 10.7% in this study was lower than that reported by other authors: 35.3% in Ghana [12], and 21.6% in Bhutan in 2019 [28]. This was however higher than 8.6% reported in Nigeria [29]. This disparity could be due to different study designs, study periods, inclusion and exclusion criteria and care provided. Most of the preterm neonates (71.8%), died during the early neonatal period, which is similar to what was observed in the YGOPH of 69% [21], and in the Yaounde Central Hospital (YCH) of 62.5% [30]. However, in Ghana in 2006 a study found that more preterm neonates (75.7%), died during late neonatal period [12].

The most common causes of death of preterm babies were in descending order of occurrence apnoea, neonatal infection, respiratory distress syndrome (RDS), anaemia and necrotizing enterocolitis. Similar findings were reported at the YCH with neonatal infection, neonatal asphyxia, congenital malformations and RDS the most common causes of death [30], while at the YGOPH, neonatal infection, neonatal asphyxia and congenital malformation were the most common causes of death [21]. A study in 2019 in Ethiopia reported RDS, neonatal infection and neonatal asphyxia [31]. Another study in the USA in 2019 reported neonatal sepsis, preterm birth related complications, neonatal asphyxia and congenital malformations [32]. Whereas, a study in 2009 found non-infectious respiratory distress, intracranial haemorrhages, and neonatal infection [33]. The differences could be due to different study designs, settings, inclusions and exclusion criteria.

## CONCLUSION

The prevalence of preterm births remains high in this setting. Information, education and communication on the importance of adequate follow up during pregnancy and delivery should be reinforced. Prevention in risk groups and prevention of PPROM can go a long way to reduce this prevalence and associated morbidity.

## ACKNOWLEDGEMENTS

Thanks to the nurses of the neonatology unit of the Regional Hospital Bamenda for helping retrieve files from the archives.

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