**ORIGINAL RESEARCH ARTICLE**

# Risk Factors for Premature Births: A Cross-Sectional Analysis of Hospital Records in a Cameroonian Health Facility

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## Abstract

The aim of this study was to investigate the risk factors for preterm births in the Yaounde Gynaeco-Obstetric and Paediatric Hospital in Cameroon, and to describe their outcomes. We conducted a cross-sectional analytical study of hospital records over eight years. The incidence of prematurity was 26.5 % of admissions over a period of 7 years 7 months. After controlling for confounding factors, we identified attending antenatal care visits in a health centre (Odds ratio [OR] 6.19; 95% Confidence interval [CI]1.15-33.22; p=0.033), having a urinary tract infection (OR 39.04; 95% CI 17.19-88.62; p<0.001), multiple gestation (OR 3.82; 95 % CI 2.68-5.43; p<0.001) and congenital malformations (OR 2.78; 95% CI 1.24-6.22; p=0.013) increased the odds of preterm birth. On the other hand being a student mother (OR 0.44; 95% CI 0.20-0.98; p=0.047), being married (OR 0.40; 95% CI 0.19-0.84; p=0.016) and more antenatal visits (OR 0.23; 95% CI 0.15-0.35; p<0.001) reduced the odds of preterm birth. Neonatal mortality in these preterm neonates was 36.6%, in which 69% occurred in the early neonatal period. The main causes of death were neonatal infections (27.6%), neonatal asphyxia (11.9%) and congenital malformations (10.3%). We recommend enhanced prenatal care and management of pathologies which arise during pregnancy. *(Afr J Reprod Health 2013; 17[4]: 77-83).*

**Keywords**: prematurity, risk factors, neonates, hospital outcome, Cameroon

## Résumé

Le but de cette étude était d'étudier les facteurs de risque de naissances prématurées à l'Hôpital Gynéco - Obstétrique et Pédiatrie de Yaoundé au Cameroun, et de décrire leurs conséquences. Nous avons mené une étude analytique transversale des dossiers de l'hôpital pendant environ huit ans. L'incidence de la prématurité a été de 26,5 % des admissions au cours d'une période de 7 ans 7 mois. Après l'ajustement pour les facteurs confondants , nous avons identifié que le fait d'assister aux consultations prénatales dans un centre de santé (Indice de possibilité [ OR] 6,19 , intervalle de confiance à 95% [ IC] de 1,15 à 33,22 , p = 0,033 ), avec une infection des voies urinaires (OR 39,04 ; 95 % CI 17,19 à 88,62 , p < 0,001) , la grossesse multiple (OR 3,82 , IC 2,68 à 5,43 95 %, p <0,001) et les malformations congénitales (OR 2,78 , IC 95% 1.24 au 6.22 , p = 0.013 ) ont augmenté les chances d'un accouchement prématuré. D'autre part, le fait d'être une mère-étudiante (OR 0,44, IC 0,20 à 0,98 95%, p = 0,047), d'être mariée (OR 0,40, IC 0,19 à 0,84 95 %, p = 0,016) et encore des consultations prénatales (soit 0,23 ; 95 % CI 0,15-0,35, p < 0,001) ont réduit les possibilités d'accouchement prématuré. La mortalité néonatale chez ces nouveau-nés prématurés était de 36,6 %, dont 69 % sont survenus dans la période néonatale précoce. Les principales causes du décès sont les infections néonatales (27,6%), l'asphyxie néonatale (11,9%) et les malformations congénitales (10,3%). Nous recommandons l'amélioration des soins prénatals et le traitement des pathologies qui surviennent pendant la grossesse. *(Afr J Reprod Health 2013; 17[4]: 77-83).*

**Mots clés:** prématurité, facteurs de risque, nouveau-nés, devenir hospitalière, Cameroun

## Introduction

Premature infants are those born before the 37th week of gestation[1]. In developing countries, the rate of prematurity is high, but few studies on the risk factors and circumstances of prematurity have been conducted[2,3]. Globally, the rate of prematurity is estimated to be 30%[4]. Over 60% of preterm births occur in Africa and South Asia[1].

Prematurity is one of the leading causes of neonatal deaths in Africa and is a major public health problem[5]. It is responsible for 27% of all

neonatal deaths[6]. Reports from Gabon, Togo and Cameroon indicate that the rate of prematurity can vary from 11.1% to 57%, with a mortality of up to 30.1%[7,8,9,10]. This problem is not limited to developing countries. In developed countries, particularly in France, the rate of prematurity has increased over the past ten years, reaching 7%[11]. This increase is due to the rise in the number of multiple pregnancies subsequent to medically assisted procreation techniques. In the United States of America, the rate of prematurity has increased from 5.9% in 1981 to 12.7% in 2005[12].

In developing countries, the management of preterm neonates is difficult because of the limited resources and insufficient or non- existent specialised care units. The *''Born-too-soon initiative''* endorses the collection of high quality data on the incidence and causes of preterm births, and the development of effective strategies to reduce the number of preterm births[13].

In order to promote the primary prevention of prematurity, we sought to calculate the incidence of prematurity over a period of 8 years at the Yaounde Gynaeco-Obstetric and Paediatric Hospital (YGOPH), determine the risk factors for prematurity, and assess the outcome of these premature infants.

### *Methods*

We conducted a cross sectional matched analysis of hospital records collected from May 2003 to December 2011 in the Neonatology Unit of the Yaounde Gynaeco-Obstetric and Paediatric Hospital. We collected data from the files of 533 premature infants (gestational age of less than 37 weeks) and 533 term live mature births (gestational age of 37 weeks or more) born in the same period. The gestational age was determined from the date of the last menstrual period as reported by the mother. Our target population was all preterm neonates (cases) admitted in the unit within the study period, however only those with sufficient legible data to establish prematurity and risk factors (533) were retained for the study. The controls were neonates with gestational ages of 37weeks or more selected in the same manner as the cases, based on legibility of records and completeness of data. They were age matched in a 1:1 ratio based on date of birth. Data were extracted from the ward registers and medical files of the neonates unto a standardized form. We extracted maternal socio-demographic data: age, marital status (married or single), educational level (primary or less and secondary or higher), and occupation (employed, self - employed, unemployed, student, jobless); gynaecological and obstetrical past history: number of antenatal visits, gravidity, parity, and pathologies during pregnancy. For the neonates we recorded the gestational age in weeks which we categorized as: extremely premature, moderately premature and mildly premature, corresponding to <28 weeks gestation, 28-31 weeks gestation and 32 to 36 weeks gestation respectively. We also noted their gender, hospital outcome and cause of death.

### *Data analysis*

Demographic and baseline characteristics are reported as number (%) or mean (standard deviation). We conducted conditional multivariable logistic regression to determine the effects of these variables on prematurity dichotomized as a yes/no variable according to gestational age as described above (<37 weeks gestation= yes). Date of birth was inserted in the models as a stratum (matching variable). Socio-demographic variables and obstetric variables were analysed in two separate models. Adjusted odds ratios (OR), their corresponding 95% confidence intervals and p-values (set at a significance level of alpha= 0.05) are reported. Variables with too much missing data precluding meaningful analyses were excluded. Data were analysed using SPSS (Statistical Package for Social Sciences) version 16.0.

### *Ethical considerations*

This study was approved by the ethics committee of the Faculty of Medicine and Biomedical Sciences and the Yaounde Gynaeco-Obstetric and Paediatric Hospital. All the files and medical records were consulted in the hospital archive room or in the neonatology unit to ensure confidentiality.

## Results

We noted that 7130 infants were admitted and 1894 were premature giving an incidence of

26.5% of admissions over a period of 7 years 7 months.

**Table 1:** Socio-demographic and baseline characteristics of the study population

| Variable | Statistic |
|---|---|
| **Maternal age (years): Mean (SD)** | 27.07 (6.17) |
| **Neonatal gender: n (%)** | |
| **Male** | 582 (54.6) |
| **Female** | 484(45.4) |
| **Level of education: n (%)** [α] | |
| Primary or less | 13 (4.1) |
| Secondary or more | 302 (95.9) |
| **Occupation: n (%)** [β] | |
| Salaried work | 182 (19.7) |
| Liberal | 183 (19.8) |
| Unemployed | 352 (38.2) |
| Student | 205(22.2) |
| **Marital status: n (%)** [μ] | |
| Single | 354 (47.1) |
| Married | 397 (52.9) |
| **Residence (urban): n (%)** | 901 (95.3) |
| **Parity: n (%)** [δ] | |
| Nullipara | 419 (41.1) |
| Primipara | 228 (22.4) |
| Grand multipara | 353 (34.6) |
| **Gravidity: n (%)** [ε] | |
| 1-4 | 840 (82.4) |
| 5+ | 179 (17.6) |
| **Antenatal care visits: n (%)** [€] | |
| None | 26 (3.4) |
| 1-3 | 209 (27.2) |
| 4+ | 527 (68.6) |
| **Place of ANC visits: n (%)** [£] | |
| HGOPY | 403 (41.8) |
| Other hospitals | 191 (61.6) |
| Health Centre | 344 (35.7) |
| **Gestational age: Mean (SD)** | 36.03 (4.1) |
| **Premature (yes): n (%)** | 533 (50.0) |

[α]751 missing; [β] 144 missing; [μ] 315 missing; [δ] 66 missing;[€]304 missing; [ε] 47 missing; [£] 128 missing

### *Socio-demographic and baseline characteristics*

The mean maternal age was 27.07 (standard deviation [SD] 6.17). Almost all of the mothers had secondary education or higher (95.9). Two thirds (68.6%) attended four or more antenatal care visits. The mean gestational age was 36.03 weeks (SD 4.1). The rest of the socio-demographic and baseline characteristics are reported in Table 1.

### *Socio-demographic factors associated with prematurity*

Being a student mother (OR 0.44; 95% CI 0.20-0.98; p=0.047) and being married (OR 0.40; 95% CI 0.19-0.84; p=0.016) reduced the odds of prematurity. See Table 2.

**Table 2:** Socio-demographic factors associated with prematurity

| Variable | N[α] | Adjusted odds ratio | 95% CI | P |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 148 | 1 | | |
| Female | 97 | 1.15 | 0.67-1.98 | 0.599 |
| **Mother's age** | | | | |
| 0-19 | 46 | 1 | | |
| 20-34 | 164 | 1.07 | 0.50-2.29 | 0.852 |
| 35+ | 35 | 1.20 | 0.36-3.95 | 0.759 |
| **Occupation** | | | | |
| Salaried | 78 | 1 | | |
| Liberal | 7 | 0.33 | 0.05-2.07 | 0.238 |
| Unemployed | 12 | 1.21 | 0.30-4.86 | 0.784 |
| Student | 148 | 0.44 | 0.20-0.98 | 0.047 |
| **Level of education** | | | | |
| Primary or less | 9 | 1 | | |
| Secondary or more | 236 | 1.94 | 0.39-9.58 | 0.416 |
| **Marital status** | | | | |
| Single | 138 | 1 | | |
| Married | 107 | 0.40 | 0.19-0.84 | 0.016 |
| **Residence** | | | | |
| Urban | 235 | 1 | | |
| Rural | 10 | 2.90 | 0.69-12.15 | 0.145 |

[α]Number used in regression analysis after list wise deletion

### *Pathologies associated with prematurity*

Having a urinary tract infection increased the odds of prematurity (OR 39.04; 95% CI 17.19-88.62; p<0.001). Other maternal pathologies such as malaria, premature rupture of membranes,

prolonged rupture of membranes, preeclampsia, eclampsia, oligohydramnios and diabetes were not associated with prematurity (data not shown).

***Foetal factors associated with prematurity***

Multiple gestation (OR 3.82; 95 % CI 2.68-5.43; p<0.001), congenital malformations (OR 2.78; 95% CI 1.24-6.22; p=0.013) and attending antenatal care visits in a health centre as compared to the YGOPH or any other hospital increased the odds of prematurity(OR 6.19; 95% CI 1.15-33.22; p=0.033). On the other hand, a higher number of antenatal care visits reduced the odds of prematurity (OR 0.23; 95% CI 0.15-0.35; p<0.001). See Table 3.

**Table 3:** Obstetric and foetal variables associated with prematurity

| Variable | N[α] | Adjusted odds ratio | 95% CI | P |
|---|---|---|---|---|
| **Gravidity** | 719 | 0.95 | 0.81-1.10 | 0.476 |
| **Parity** | 706 | 1.20 | 0.97-1.47 | 0.086 |
| **Antenatal care** | 719 | 0.23 | 0.15-0.35 | <0.001 |
| **IPT** | | | | |
| Yes | 476 | 1 | | |
| No | 143 | 1.25 | 0.82-1.92 | 0.301 |
| **Place of antenatal care** | | | | |
| YGOPH | 266 | 1 | | |
| Other hospital | 131 | 2.32 | 0.44-12.34 | 0.323 |
| Health centre | 208 | 6.19 | 1.15-33.22 | 0.033 |
| **Multiple gestation** | | | | |
| No | 832 | 1 | | |
| Yes | 191 | 3.82 | 2.68-5.43 | <0.001 |
| **Congenital malformations** | | | | |
| No | 995 | 1 | | |
| Yes | 28 | 2.78 | 1.24-6.22 | 0.013 |

[α]Number used in regression analysis after list wise deletion

***Hospital outcome***

Three-hundred and twenty one (63.4%) of the preterm infants were discharged alive compared to 185 (36.6%) who died in the hospital. The average length of hospitalisation was 8.24 days (range 0-65 days). Most preterm infants (69.0%), died in the early neonatal period, between 0 and 7 days. The main causes of death included neonatal infections (27.6%), birth asphyxia (11.9%) and congenital malformations (10.3%).

## Discussion

The incidence of prematurity in our study was 26.5%. This is greater than the 21.05% noted at the Yaounde Central Hospital in 1998[9], and less than the 57% observed in 2005 at the Yaounde Teaching Hospital both in Cameroon.[10]In other African studies, the incidence ranged from 2.6% to 15.1%[7,8,14,15,16]. The Yaounde Gynaeco-Obstetric and Paediatric Hospital is one of the main mother and child referral health facilities in Cameroon, and often receives difficult cases. This might explain the relatively high incidence rate in our study. More of the preterm infants were males. Ugochukwu et al, in Nigeria noted a similar finding[17]. However, Diagne in Senegal noted a female predominance[18].

The single matrimonial status was a risk factor for prematurity. This could be explained by the fact that single women, often lack enough financial and psychological support needed by all pregnant mothers to ensure adequate follow- up of their pregnancies. A similar finding has been observed in other studies[14,15,19]. The single status during pregnancy in this setting may reflect a hazardous social environment, especially in places where the male family members are the reproductive health decision-makers[20]. On the other hand, Ndiaye et al, in Senegal[21],and Foix-Helias et al in France,[22]found no relationship between marital status and prematurity.

In this study, the number of antenatal visits and urinary tract infections were associated with higher odds of premature births. Ndiaye et al[21], and Prazuck et al[14], also noted that having less than 4 antenatal visits significantly increased the risk for prematurity. The WHO recommends at least four antenatal visits during a pregnancy[23].This is important in order to ensure quality follow-up and early detection of high risk pregnancies. Insufficient monitoring of pregnancies in developing countries appears to result from the lack of an efficient health

care system for perinatal care and a very unfavourable social environment[8].

Having a urinary tract infection was also a significant risk factor as observed in other studies[8, 19,24]. Urogenital infections are very common during pregnancy and are important causes of premature labour[23]. Multiple gestations (77.4%) were associated with higher odds for prematurity. Other authors have noted similar findings but with lower percentages: 13.7% in Senegal[18], 17.7% in Togo[8], and 20% in Congo[25]. In France, the rate of twin pregnancies was high with 86% as the main cause of prematurity[26]. Births from multiple pregnancies are mostly premature, and these pregnancies often result from the use of ovulatory drugs and the increased use of medically assisted reproductive techniques in the treatment of infertility[26,27,28.]

The presence of malformations significantly influenced preterm births in our study. Diagne in Senegal found congenital malformations amongst 2.5% of preterm neonates[18].In the United States, they occur in approximately 3% of all births and in 12.5% of preterm newborns[29]. The causes of birth defects and the mechanisms that may explain the occurrence of prematurity are unknown, but may probably have resulted from an interaction between environmental and genetic risk factors[29,30]. According to Kase et al, foetuses with congenital malformations have a higher risk of complications that can lead to premature delivery[30]. In our milieu, these malformations are not always detected during pregnancy, most likely due to late diagnosis or poor follow up of pregnancies attributable to financial constraints.

The mortality rate in our study was quite high, despite the fact that our hospital is a referral hospital and recently improved in terms of infrastructure and personnel for the appropriate management of neonates. Despite these efforts, the overall death rate is higher than the 30% reported by the WHO in 2008[4]. Tietche et al noted a mortality rate of 75.5% at the Yaounde Central Hospital[31], unlike Monebenimp et al, who observed a rate of 3.5% at the Yaounde University Teaching Hospital[10]. Other African studies noted 28% in Senegal[18], 29% in Tanzania[32], and 30.7% in Nigeria[33]. This is an overall rate over an eight year period compared to other authors with study periods of 1 to 2years.There is a possible variation over the years with decreasing mortality following improvement of the infrastructure and training of personnel. The main causes of death in the premature neonates were neonatal infections, birth asphyxia and congenital malformations. Ugochukwu et al. observed respiratory distress syndrome (40%), asphyxia (33.4%), and sepsis (13.3%) as major causes of death[17]. Schrestha et al identified hyaline membrane disease, sepsis and necrotising enterocolitis at 64.5%, 58.06% and 25.8% respectively, as major causes of death[34].

Overall, our findings reflect current literature in low resource settings and highlight the urgency of dealing with the determinants and effects of prematurity. These findings may be applicable in other resource limited settings.

The main limitations of our study are the cross sectional design and the large amounts of missing data due to poorly kept paper-based hospital records. The cross-sectional design is not the most efficient way of eliciting risk factors because we must rely on previously collected records, which were often not collected with the purpose of research. This can be seen with the large number of records that could not be used and the amounts of missing data.

## Conclusion

Prematurity is a major public health concern in developing countries with high morbidity and mortality. Identifying factors that can lead to preterm deliveries will help improve the follow- up of pregnant women, and avoid preterm births. We thus recommend that health centres be reinforced with trained personnel, and well equipped for adequate follow up of pregnancies. Pregnant women should also be well educated on the importance of diagnoses and treatment of urinary tract infections. Multiple pregnancies and congenital malformations should be considered high risk and referred for specialist management. These measures, to be undertaken by health personnel in antenatal clinics represent the best perspectives for the prevention of prematurity in our milieu.

### *Competing interests*

The authors declare that they have no competing interests.

## Authors' contributions

Dr. A. Chiabi conceived the study.
Drs. E.M. Mungyeh, N. Mvondo, S. Nguefack, K.K. Kamga collected the data from the hospital records.
Dr. L. Mbuagbaw reviewed and revised the study design.
Dr. L. Mbuagbaw and Shiyuan Zhang carried out the statistical analysis.
Dr. N. Mvondo drafted the first manuscript.
Drs. A. Chiabi, L. Mbuagbaw and E.M.Mungyeh reviewed and revised several versions of the manuscript.
Profs. E. Mboudou, P.F. Tchokoteu, E. Mbonda revised the manuscript critically for important intellectual content.
All authors read and approved the final manuscript.

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