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# Incidence and Determinants of Prematurity in the City of Kinshasa, Democratic Republic of the Congo

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## Abstract

**Introduction:** The fight against prematurity is part of a global approach to improving neonatal morbidity and mortality parameters. This study was initiated with the aim of identifying the determinants of prematurity in the city of Kinshasa. **Methods:** This is a cross-sectional study conducted in Kinshasa in the HZs of Gombe, Limete and Kingasani during the period from November 25, 2021 to February 25, 2022. A total of 1266 mothers took part in the study. The data were collected by interview coupled with documentary analysis with the support of a questionnaire. These data were analyzed using SPSS 25 software. The determinants were retained from the results of the logistic regression by considering the Odds Ratio with their 95% confidence interval. **Results:** The overall incidence of prematurity during the study period was 20.14%. The determinants were: residence in the Kingasani health zone [OR = 1.77 (1.24, 2.55); p = 0.002]; being married [OR = 1.87 (1.19, 3.03); p = 0.009]; heavy activities during pregnancy [OR = 1.53 (1.11, 2.13); p = 0.010] as well as dietary restrictions [OR = 2.57 (1.61, 4.06); p = 0.010]. While the Bangala tribes [OR = 0.60 (0.41, 0.89); p = 0.010] and luba [OR = 0.61 (0.47, 0.94); p = 0.025] emerged as protective factors against prematurity. **Conclusion:** The prematurity rate in the DRC remains high and stagnant despite the efforts already made by Congolese actors. Maternal precariousness is a major determinant that contributes to prematurity, and as such it is likely to increase perinatal morbidity and mortality.

**Subject Areas**

Public Health

**Keywords**

Level, Determinants, Prematurity, Democratic Republic of the Congo

## 1. Introduction

Prematurity is defined as any child born before 37 completed weeks of amenorrhea (SA); it is observable in all countries. Globally, prematurity is the leading cause of death in children under 5 years old. About 85% of children born before 37 WA are moderate or late prematurity (32 - 36 weeks of amenorrhea), 10% severe prematurity (28 - 31 weeks of amenorrhea), and 5% very severe prematurity (<28 weeks of amenorrhea) [1].

In higher-income countries, despite technological advances, knowledge about prematurity and the application of multiple public health interventions to try to reduce it remains futile. The incidence of preterm birth continues to increase in recent years. In most countries, data from the World Health Organization (WHO) claim that 9% of cases are notified [2]. Other data from the same organization indicate that where effective obstetric services exist, continuity of obstetric care decreases prematurity by approximately 24% [3].

Also, in developing countries, more than 60% of premature births occur in Africa and South Asia, but this is truly a global problem. In the poorest countries, there are on average 12% of children born prematurely. Within the countries themselves, the most modest families present an increased risk [3], whereas, in the United States, it rose from 9.5% to 12% of premature births in 2010 [4].

Thus, various analyzes show that prematurity is due to various reasons. Most preterm births occur spontaneously, but some are the result of the early onset of contractions or cesarean delivery, whether for medical reasons or not [3].

The events leading to preterm births are not fully understood despite the fact that the etiologies are multifactorial. Causes related to prematurity include medical conditions of the mother or fetus, genetic factors, environmental causes, socio-economic factors, and iatrogenic prematurity [5].

According to a study carried out in French Guiana, social risk factors and poor follow-up during pregnancy were associated with spontaneous prematurity. Lack of health insurance was a risk factor for prematurity with an adjusted OR of 1.9 [95% CI = 1.6 - 2.3], $p < 0.001$ [6]. Some authors observe links between pregnancy less than 37 completed weeks of amenorrhea, maternal age less than 18 years and greater than 35 years [7]. The presence of a history of preterm birth, less adherence to pregnancy monitoring and twin pregnancy are associated with prematurity [8].

In addition, another study done in the USA and England among black women

of African-American or Afro-Caribbean origin, they are more at risk of prematurity (16% to 18%) than white women (5% to 9%). That is to say that the different categories of populations in the world do not have the same risk of prematurity [9].

Furthermore, prematurity remains a worrying infant health problem in the Democratic Republic of the Congo (DRC), due to its high frequency, the lethality it causes and the difficulties in caring for individuals and families, placing the DRC among countries with a high prevalence of prematurity [3].

According to data from estimates of preterm birth rates made at the national, regional and global levels during the year 2012, DR Congo recorded 11.9% preterm birth rate per 100 births [10].

The risk of preterm birth is classic, and the risk factors are modifiable. Prematurity is a major public health problem in general in the world and in particular in the city of Kinshasa. The WHO has revealed that the frequency of premature births is around 12% in developing countries [3]; however, no specific comparative study has been carried out on the socio-economic and cultural determinants of prematurity in hospitals in the city of Kinshasa. The present study aims to fill this gap; it seeks, in fact, to determine the incidence of prematurity in Kinshasa, to identify and describe the socio-economic and cultural factors associated with it and propose ways and means aimed at reducing prematurity in the city of Kinshasa.

## 2. Material and Method

### 2.1. Description of the Study Environment

The study was conducted in three health zones in the city of Kinshasa. In particular the health zone of Gombe (as survey structures: the Provincial General Reference Hospital of Kinshasa and the Ngaliema General Reference Hospital); the Kingasani health zone (as survey structures: Kingasani Hospital Center and Maman Tembo Health Center); as well as the Limete health zone with the Saint Joseph Hospital and the Bondeko clinic as survey structures.

The choice of these structures is based on the fact that they are the major reference structures in the city of Kinshasa where premature newborns are housed.

### 2.2. Target Population, Study Sample and Sampling Method

The target population of this study concerns all the women who gave birth during the study period, of which the total number is 1266 who gave birth.

To achieve this sample, we used probability sampling at several stages. At the first degree, we listed all the referral hospitals in the 3 health zones of the city province of Kinshasa, then randomly selected two hospitals for each health zone. Thus, the drawn structures, the Kinshasa Provincial General Reference Hospital and the Ngaliema General Reference Hospital are reference structures in the Gombe Health Zone, the St Joseph Hospital and the Bondeko Hospital are health structures in the Limete Health Zone, and finally the Kingasani Hospital Center

and CSM Tembo in the Kingasani Health Zone.

At the second level, taking into account that these reference health structures choose which do not have the same attendance of pregnant women, women who have given birth, we have decided to proceed with the proportional stratification considering for each health structure, the number of women who have given birth for the year preceding this study (2020). Thus, based on the frequency of childbirth per year, we calculated the proportion for each hospital, also taking into account the size of our sample.

### 2.3. Collection of Data

The data is collected in a transversal way in the city province of Kinshasa for a period going from 25/11/2021 to 25/02/2022. We collected data using questionnaire methods comprising closed and open questions, and documentary analysis (medical records and CPN sheets). The variables used in this study derive their reference from the model of the coefficient of the risk of preterm birth, according to Papiernik-Berkhauer (1969) [11], with the addition of two or three factors of maternal, socio-economic, cultural and obstetrical risk exposing to risk of premature delivery. It is on the basis of this frame of reference that we have our questionnaire. The files analyzed to complete the data according to the study variables came from hospitals.

### 2.4. Data Analysis and Processing Plan

The data from the collection site recorded on the data collection tools by the investigators were compiled, codified, the data entry was done using the Excel 2010 spreadsheet and the SPSS 2025 software to analyze the identification variables of the respondents.

First, we proceeded to a description of the data by calculating the percentages; which allowed us to approach the bivariate analysis, where we crossed the independent variables with the dependent variable to establish the existence or not of the links between the different factors and prematurity using the Chi-square test of Pearson (*Chi* 2). But to identify risk factors for prematurity, adjusted logistic regression is used. The odds and the 95% confidence interval are calculated with an alpha error risk set at 5%.

### 2.5. Ethical Considerations

This research complies with the obligations concerning the respect of the dignity of the people surveyed, the rights of participation in the study, the confidentiality of the answers provided and the prevention of harm. They were observed continuously throughout the entire process of data collection and dissemination of results. Respondents were contacted after they gave their consent to participate in the study. Information was provided to them verbally and explanations on the ethical aspects of the research were provided to them using an explanatory sheet which was attached to each questionnaire. The respondents were also assured that

their participation was free and voluntary, and that they could put an end to their collaboration without this action being harmful to them.

## 3. Results

In Table 1, the association between socio-demographic characteristics and prematurity, our results show that the socio-demographic characteristics associated with prematurity were place of residence ($p = 0.002$); the tribe ($p = 0.015$) then the marital status ($p < 0.001$).

The results of Table 2 which speak of the association between socio-cultural characteristics and prematurity, we found a statistically significant association between religion and prematurity ($p = 0.033$). On the other hand, there are no statistical links between the level of education of the mother ($p = 0.170$); father's level of education ($p = 0.070$) and information on pregnancy ($p = 0.505$) and prematurity.

With regard to the association between socio-economic activities and prematurity, it emerges from Table 3 that the socio-economic activities having an influence on prematurity were: male income-generating activity ($p = 0.046$); that of the woman before pregnancy ($p < 0.001$); the type of work carried out by the woman ($p = 0.006$); activity during pregnancy ($p = 0.015$) as well as the fact of being a tenant of housing ($p < 0.001$).

With regard to the association between the conditions of Pregnancy and prematurity, the results in Table 4 highlight a relationship between the age of pregnancy and prematurity ($p < 0.001$) on the one hand, then the existence of a pathology before pregnancy and prematurity ($p < 0.001$) on the other hand.

By analyzing Table 5, the association between maternal history and prematurity, a link is observed between the history of curettage and prematurity ($p = 0.034$). No significant link is observed between the history of live births ($p = 0.765$), the history of stillbirths ($p = 0.851$); Previous term births ($p = 0.975$); the history of abortion ($p = 0.378$); history of prematurity ($p = 0.449$) history of curettage ($p = 0.034$) and prematurity.

In addition, the association between the elements monitoring pregnancy and prematurity, we observe in Table 6 that the food ban has an influence on prematurity ($p < 0.001$). However, knowledge of the DDR ($p = 0.769$), gestational age ($p = 0.102$) and inter-birth interval ($p = 0.695$) do not statistically determine prematurity. In addition, the way of using ANC, the types of ANC providers, the number of ANC performed, the age of initiation of the first ANC and the age at the last ANC respectively have a statistically non-significant influence facing prematurity ($p = 0.114$, $p = 0.8570$, $p = 0.089$, $p = 0.078$, $p = 0.932$).

At the end of the multivariate analyzes based on the binary logistic regression model, the determinants of prematurity highlighted by the present study as shown in Figure 1 are: Compared to the Bakongo, the ***Bangala tribes*** [OR = 0.60 (0.41 - 0.89); $p = 0.010$] and ***luba*** [OR = 0.61 (0.47 - 0.94); $p = 0.025$] protect against prematurity; Residence in the ***Kingasani*** health zone exposes 1.77 times more to

**Table 1.** Association between socio-demographic characteristics and prematurity.

| | | Prematurity | | |
|---|---|---|---|---|
| **Variables** | **Terms** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Health zone | Gombe | 63 | 359 | 0.002 |
| | Kingasani | 104 | 318 | |
| | Lime | 88 | 334 | |
| Tribe | Bakongo | 66 | 174 | 0.015 |
| | Bengali | 82 | 375 | |
| | Baswahili | 55 | 221 | |
| | Luba | 52 | 241 | |
| Age (median) IQR] | | 30.00 | 29.00 | 0.763 |
| Marital status | Single | 25 | 148 | <0.001 |
| | Divorcee | 11 | 79 | |
| | Bride | 189 | 600 | |
| | Free union | 10 | 40 | |
| | Widow | 20 | 144 | |
| Legitimacy of marriage | Yes | 150 | 662 | 0.056 |
| | No | 105 | 349 | |
| Type of marriage (%) | Monogamous | 247 | 946 | 0.062 |
| | Polygamous | 8 | 65 | |
| Person in charge (median [IQR]) | | 8.00 | 7.00 | 0.174 |

**Table 2.** Association between socio-cultural characteristics and prematurity.

| | | Prematurity | | |
|---|---|---|---|---|
| **Variables** | **Terms** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Mother's level of education | None | 44 | 192 | 0.170 |
| | Primary | 51 | 209 | |
| | Secondary | 84 | 264 | |
| | University | 76 | 346 | |
| Father's education level | None | 58 | 194 | 0.070 |
| | Primary | 56 | 174 | |
| | Secondary | 65 | 266 | |
| | University | 76 | 377 | |
| Mother's religion | Believer | 211 | 890 | 0.033 |
| | Non believer | 44 | 121 | |
| Pregnancy information | Yes | 173 | 661 | 0.505 |
| | No | 82 | 350 | |

**Table 3.** Association between socio-economic activities and prematurity.

| | | Prematurity | | |
|---|---|---|---|---|
| **Variables** | **Terms** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Human activities | Audience | 28 | 166 | 0.046 |
| | Arts and crafts | 38 | 132 | |
| | None | 14 | 68 | |
| | Trade | 61 | 229 | |
| | Farmer | 66 | 190 | |
| | Private | 48 | 226 | |
| Have an activity before the pregnancy of the woman | No | 46 | 88 | <0.001 |
| | Yes | 209 | 923 | |
| Type of activities | Paid work with physical effort | 88 | 291 | 0.006 |
| | Paid work | 36 | 229 | |
| | Housework | 85 | 403 | |
| Activity during pregnancy | No | 97 | 473 | 0.015 |
| | Yes | 158 | 538 | |
| Home owner | Yes | 97 | 235 | <0.001 |
| | No | 158 | 776 | |

**Table 4.** Association between pregnancy conditions and prematurity.

| | | Prematurity | | |
|---|---|---|---|---|
| **Variables** | **Terms** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Pregnancy age (mean (SD) | | 35.15 | 37.45 | <0.001 |
| Pathology before pregnancy | Yes | 31 | 231 | <0.001 |
| | No | 224 | 780 | |
| Gesture (median [IQR]) | | 4.28 | 4.34 | 0.702 |
| Parity (median [IQR]) | | 4.28 | 4.34 | 0.702 |

**Table 5.** Association between maternal history and prematurity.

| | | Prematurity | | |
|---|---|---|---|---|
| **Variables** | **Terms** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Live births (mean (SD)) | | 3.83 | 3.79 | 0.765 |
| ATCD of stillbirths (median [IQR]) | | 1.00 | 1.00 | 0.851 |
| Previous term births (%) | Yes | 184 | 733 | 0.975 |
| | No | 71 | 278 | |

**Continued**

| | | | | |
|---|---|---|---|---|
| Abortion ATCD | Yes | 90 | 325 | 0.378 |
| | No | 165 | 686 | |
| ATCD of prematurity | Yes | 101 | 372 | 0.449 |
| | No | 154 | 639 | |
| ATCD of curettage | Yes | 167 | 586 | 0.034 |
| | No | 88 | 425 | |

Table 6. Association between pregnancy surveillance items and prematurity.

| | Prematurity | | |
|---|---|---|---|
| **Variables** | **Yes (n = 255)** | **No (n = 1011)** | **p-value** |
| Knowledge of DDR | | | |
| Yes | 89 | 343 | 0.769 |
| No | 166 | 668 | |
| Gestational age (median [IQR]) | 8.00 | 8.00 | 0.102 |
| Prohibited food | | | |
| No | 220 | 948 | <0.001 |
| Yes | 35 | 63 | |
| Birth interval (mean (SD)) | 2.17 | 2.19 | 0.695 |
| ANC | | | |
| Yes | 151 | 655 | 0.114 |
| No | 104 | 356 | |
| ANC providers | | | |
| Healer | 13 | 66 | |
| Male nurse | 101 | 402 | 0.857 |
| Doctor | 43 | 164 | |
| Midwife | 98 | 379 | |
| Number of CPN performed (median IQR) | 2 | 2 | 0.089 |
| Age of initiation of CPN1 (median IQR) | 4 | 4 | 0.078 |
| CPN last | 6 | 8 | 0.932 |

the risk of prematurity [OR = 1.77 (1.24 - 2.55); p = 0.002]; Being ***married*** gives 1.87 times more chance of giving birth before term [OR = 1.87 (1.19 - 3.03); p = 0.009]; Heavy ***activities during pregnancy*** expose 1.53 times more to prematurity [OR = 1.53 (1.11 - 2.13); p = 0.010]; Food ***restrictions*** give 2.57 times more chance of premature birth [OR = 2.57 (1.61 - 4.06); p = 0.010]

## 4. Discussion

It emerges from this study that the incidence of prematurity in the city of Kinshasa is 20.14%. This value is higher than the data published by the WHO in 2020. These data coming from estimates of the rates of premature birth carried

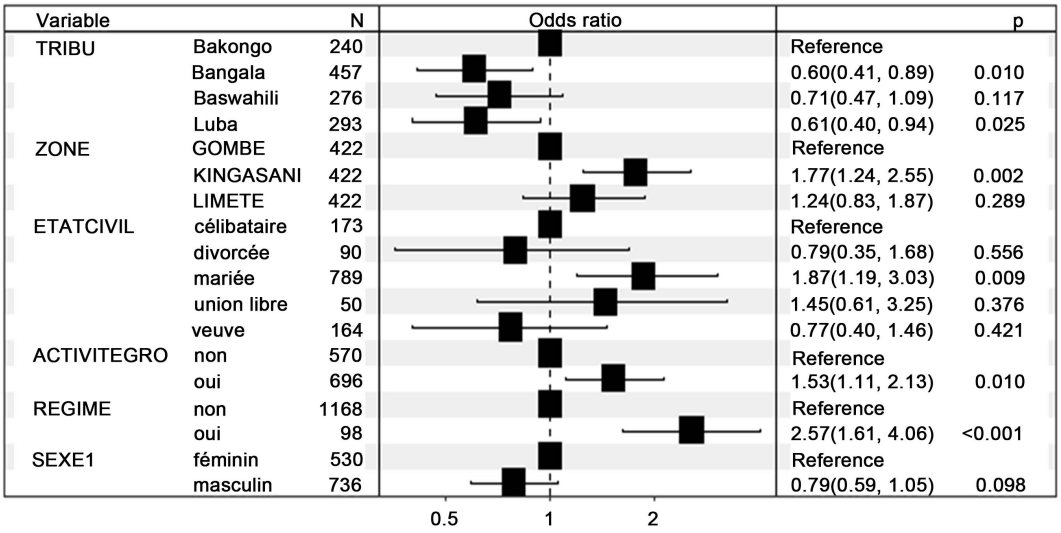


**Figure 1.** Results of multivariate analyzes by binary logistic regression.

out at the national, regional and global levels during the year 2012, show that the DR Congo recorded 11.9% premature birth rate [10]. Data from the World Health Organization [3] ranks the Democratic Republic of the Congo among the ten countries with a high rate of premature birth. The prevalence of premature births varies from country to country. The DRC registers 341,400 premature babies, India occupies the first place with 3,519,100 followed by China with 1,172,300, Nigeria with 773,600. The WHO also cites Pakistan with 748,100, Indonesia 675,700; the United States of America 517,400; Bangladesh 424,100; the Philippines 348,900 and Brazil 279,300. The province of Kasai Oriental recorded 594 premature babies out of 106,375 live births, a rate of 0.6% during 2014 [12].

Other data in the literature are consistent. In the Maghreb, the prevalence of prematurity varied between 6.7% and 15.4% [13]. In the Guyanese context, the proportion of premature births was 13.5% [14]. In addition, other frequencies lower than our results are reported elsewhere. The WHO notes that Libya has recorded nearly 12,100 premature births out of the 145,000 registered each year, estimating the prevalence at around 8.3%. A study conducted in Benghazi in 2011 during the armed conflict found an increase in the prevalence of prematurity from 2.5% before the conflict to 3.6% during the armed conflict.

In Tunisia, a retrospective analysis [6] carried out over the period 1994-2012 in Monastir by, found an average rate of global prematurity of 5.6% and pointed out that this rate continued to increase from year to year. While it was 4.8% in 1994 to reach 7.2%. In Kairouan, Diouf *et al.* (2007) [15] counted in a neonatology unit of the Albert Royer children's hospital in Dakar, Senegal 67.7% mild prematurity, 27.8% very premature and 4.5% extreme premature. Mauritania had the highest prevalence of premature births at 15.4% according to the report published by the WHO in 2012. On the other hand, Niokhor *et al.* (2017) [16], report a prevalence of 40.9% which is higher than the rate found in this study.

Considering the Tribe, compared to the Bakongo, the Bangala (OR = 0.60 [0.41

- 0.89]; p = 0.010) and Luba (OR = 0.61 [0.47, 0.94]; p = 0.025) tribes protect against prematurity. In the literature, other data are congruent. In Guyana, the hypothesis suggesting that part of the high prematurity rate is linked to the fact that "black" babies are more mature and that "black" mothers of Afro-Caribbean descent give birth physiologically earlier, did not emerge in the analyses. It has been observed that in the "black" population, birth at 36 WA compared to 37 WA would be a risk factor [14].

In this study, residence in the Kingasani health zone exposes 1.77 times more to the risk of prematurity [OR = 1.77 (1.24, 2.55); p = 0.002]. Some data are consistent; a systematic review by Wolde *et al.* (2019) [17] had shown that the unfavorable social conditions of rural residence were linked to prematurity. As a reminder, the ZS of Kingasani is located in the eastern part of the city of Kinshasa, in the commune of Kimbanseke. Economically, the majority of the active population of the ZS is in the informal sector and lives mainly in small businesses and market gardening activities.

In Kinshasa, being married is 1.87 times more likely to give birth before term [OR = 1.87 (1.19, 3.03); p = 0.009]. These results are in agreement with certain studies having shown that marriage would give less chance for the pregnant woman to control the evolution of her pregnancy well from the beginning. This category of women is therefore exposed to late initiation of prenatal visits [18]. However, the early detection of anomalies during gestation thanks to these visits would make it possible to prevent any preterm birth by setting up an appropriate pregnancy monitoring system.

In our context, these results would also mean that unmarried women seek prenatal care early for fear of complications that may arise during pregnancy. This idea would also be supported by the fact that most pregnancies occur accidentally following a relationship with, in certain situations, paying partners. The initiative to consult the services finds its motivation in the search to get rid of the load. However, the advice given by the service providers changes people's minds and one then switches to awareness and strict observation of the pregnancy of which one is a carrier.

Activities during pregnancy expose 1.53 times more to prematurity [OR = 1.53 (1.11, 2.13); p = 0.010]. Studies show that there is a real benefit for the fetus and for the mother in the practice of a sporting physical activity during pregnancy. However, carrying a heavy load has serious consequences on the development of the pregnancy and increases the risk of expulsion of the fetus before 37 weeks of amenorrhea [19].

Pregnant women should therefore avoid work requiring a great deal of physical effort because these are likely to trigger premature delivery by hyperactivity of muscles, including that of the uterus.

Food restrictions give 2.57 times more risk of premature birth (OR = 2.57 [1.61 - 4.06]; p = 0.010). According to certain socio-cultural characteristics, pregnancy and childbirth form the heart of the traditions, cultures and customs of Africans in general because it results in the survival of the community. Each society has

developed by observation of nature and by the creation of myths and religions, a set of rites of protection and prohibitions aimed at protecting the mother and the fetus. The nursing staff in charge of such uprooted patients should, with the help of cultural mediators, strive to minimize customs and prohibitions and try to obtain trust through a respectful and attentive attitude and adapt their practices as best they can respecting the safety rules [20] [21].

## 5. Conclusion

The prematurity rate is 20.14% in maternities in Kinshasa and it remains high. Logistic regression revealed five determinants of prematurity in Kinshasa. These are the Bangala tribes, residence in the Kingasani health zone, being married, heavy activities during pregnancy and dietary restrictions. Socio-economic factors are important determinants of perinatal health; maternal precariousness is, therefore, likely to increase perinatal morbidity and mortality.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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