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# Prevalence and clinical correlates of very low weight births at goma, democratic republic of congo

## Abstract

**Background and objective:** Very low birth weight (VLBW) infants are a serious health problem. The present study intends determine the prevalence of VLBW at Goma city, Democratic Republic of Congo (DRC).

**Method:** A cross-sectional prospective survey was conducted among newborns at the major hospitals of Goma (DRC) during the six months period 01/02/2010 up to 30/07/2010. A representative sample (n=1,156) was included. Data on mothers' basic characteristics were collected. Analysis consisted of descriptive statistics, bivariate and multivariate analyses. A p-value of <0.05 was considered significant.

**Results:** 1,156 newborns were included in the study. Mothers mean and median's ages were 26.5 years (95%CI: 26.2-26.9) and 26.0years respectively. The overall prevalence of VLBW was 1.3% (95%CI: 0.6-1.9). It was 2.9% (95%CI: 0.8-5.0) at the public hospital and 0.9% (CI 95%: 0.3%-1.5%) in the private sector. The difference was statistically significant (Pearson chi-squared: p=0.014). Delivering at the public hospital (Pearson chi-squared p=0.014) and a history of abortions (Pearson chi-squared p=0.000) were strongly related to risk of VLBW however the association did not hold in logistic regressions.

**Conclusion:** The prevalence of VLBW at Goma city (DRC) appears to be abnormally low close to that of developed countries.

**Keywords:** prevalence, clinical correlates, very low birth weight, goma city, congo

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**Abbreviations:** VLBW, very low birth weight; DRC, democratic republic of congo; IUGR, intrauterine growth restriction; LBW, low birth weight; HPNK, hospital of north-kivu province

## Introduction

Very low birth weight (VLBW) is defined as" an infant whose weight at birth is less than 1500grams, regardless of gestational age".[1] Obstetrical history, newborn physical examination and examination for maturational age are critical data to differentiate premature LBW from more mature growth-retarded LBW infants. The primary causes of VLBW are premature birth (born <37weeks gestation, and often <30weeks) and intrauterine growth restriction (IUGR), usually due to problems with placenta, maternal health, or to birth defects.[2] The overall prevalence of VLBW in the United States of America (USA) was estimated, in 2012, to be around 1.4% (Whites 1.1% and Blacks 2.8%).[3]

Risk factors include, apart from premature birth, race, age, multiple births (more than one fetus carried to term), maternal smoking, low maternal weight gain or low pre-pregnancy weight, maternal or fetal stress, infections, and violence toward the pregnant woman.[2,4] VLBW is a strong predictor of a numerous health problems. The following have been largely documented: early mortality, hypothermia, hypoglycemia, perinatal asphyxia, respiratory problems, fluid and electrolyte imbalances, hyperbilirubinemia, anemia, impaired nutrition, infection, neurologic disorders, ophthalmologic complications, hearing defects, Sudden infant death syndrome etc.[2,5,6–8]

Mortality among heavier, but still low birth weight, babies (between 1,500 and 2,499grams, or five pounds and a half pounds) is much lower (around one percent), though still higher than the mortality of babies who are born above that weight (about one-quarter of a percent).[9] There is a paucity of studies conducted in Sub Sahara Africa on the subject of VLBW and none, to our best knowledge, has been conducted in the Kivu region of the Democratic Republic of Congo (DRC) hence the rationale of the present study. We intend determine the prevalence of VLBW at the main hospitals of Kivu's Goma city and identify the associated clinical correlates.

## Subjects and method

### Setting

The present study was conducted at the main hospitals of Goma, a city of about 600,000 inhabitants at the time of study implementation. It is located in Kivu region, Eastern part of DRC. The following five major local hospitals were included: The public referral hospital of North-Kivu province (HPNK), a 200 beds institution, and four private hospitals CBCAV (CBCAV), Charité Maternelle (CMATERN), HEALAFRICA (HAFRICA) and BETHESDA (BETHESD).

### Design

A cross-sectional, period, prospective and hospital-based survey was adopted. A structured questionnaire administered by trained operators and obstetrical records of mothers were used to gather the appropriate information.

### Study's Population and Period

The study population was made of live newborns at the cited five major hospitals of Goma city during the six months period 01/02/2010 to 30/07/2010. Only singletons and the heaviest baby (in case of twins or multiple births!) were included in the study.

### Sampling and Sample Size

A systematic random and concomitant sampling was conducted

at the cited hospitals. The sample size estimates was based on the following assumptions:

i. The average prevalence of VLBW in Sub Sahara Africa is ≈2.0%.[10]

ii. The prevalence of VLBW in the Eastern areas of DRC is expected to be higher than the above cited if we take account of the fact that they have, for a long time, been theaters of recurrent complex humanitarian disasters including a devastating volcano eruption.

iii. A realistic expected prevalence of VLBW is, according to our estimates, around 3.5%.

Therefore a minimum sample size of 1,156 was required (p=90%, alpha=5%). The study was concluded when this number was reached (HPNK public hospital n=242 and the private hospitals as a whole n=914).

### Data Management and Statistical Analysis

Data of interest were extracted manually from questionnaires and mothers' obstetrical records, transferred in a Microsoft Office 2007 spreadsheet and finally in the statistical package STATA 12/SE. They consisted of basic sociodemographics (maternal age, residence, marital status, education attainment, occupation status) and selected health-related factors (hospital type, antenatal care uptake, parity, previous cesarean section, stillbirths, maternal height, pre pregnancy maternal weight, newborn's weights, newborns sex, number of newborns) factors. We were unable to obtain reliable information about the following potentially relevant factors: mothers' individual and household revenues, nutritional status, HIV status and malaria laboratory test results, newborns' fathers' height and weights.

We first performed descriptive statistics. Then followed Pearson chi-squared and Wilcoxon Rank Sum tests. We concluded by a logistic regression. Models building was based on "backwise stepwise" selection while standard tests (post logistic Hosmer-Lemeshow test and ROC curve) were used for models "goodness-of-fit" assessment. The level of statistical significance was set to <0.05. Analyses were carried out by means of the statistical package STATA 12.0/SE.[11]

## Results

1,156 newborns were included in the study. The overall age's mean of mothers was 26.5years (95%CI: 26.2-26.9) and the median 26.0years. There was no significant difference of age distribution (Wilcoxon Rank Sum test p=0.750) between HPNK public hospital (Mean=26.5years; 95%CI: 25.8-27.3) and the private sector hospitals taken as a whole (Mean=26.5years; 95% CI: 26.1-26.9). The overall prevalence of VLBW newborns was 1.3% (95%CI: 0.6-1.9) while it was 2.9% (95%CI: 0.8-5.7) at the HNPK public hospital and 0.9% (95%CI: 0.3-1.5) in the private sector, the difference between the two values was statistically significant (Pearson chi-squared: p= 0.014).

Delivering at the public hospital (Pearson chi-squared p=0.014) and a history of abortions (Pearson chi-squared: p=0.000) were strongly related to risk of VLBW however the association disappeared once controlled for potential confounders (socio demographic factors!) (Table 1-3).

**Table 1** Distribution of the sample by socio demographics: maternal age, residence, marital status, education attainment and occupation status

| **Maternal age (years)** | | | | | | |
|---|---|---|---|---|---|---|
| **Hospital** | **Number** | **Mean** | **Standard deviation** | **Minimum** | **Maximum** | |
| HPNK public | 242 | 26.5 | 5.9 | 14 | 41 | |
| Private hosp. | 914 | 26.5 | 6.2 | 13 | 45 | |
| Total | 1 ,156 | 26.5 | 6.1 | 13 | 45 | |
| Residence n(%) | | | | | | |
| | | Goma | Rural | | | |
| HPNK public | 242 | 239 (98.8) | 3 (1.2) | | | |
| Private hosp. | 914 | 863 (94.4) | 51 (5.6) | | | |
| Total | 1,156 | 1,102 (95.3) | 54 (4.7) | | | |
| Marital status n(%) | | | | | | |
| | | Married | Singles | Separated | Widowers | |
| HPNK public | 242 | 229 (94.6) | 13 (5.4) | 0 (0.0) | 0 (0.0) | |
| Private hosp. | 914 | 844 (92.3) | 67 (7.3) | 3 (0.3) | 0 (0.0) | |
| Total | 1,156 | 1,073 (92.8) | 80 (6.9) | 3 (0. 3) | 0 (0.0) | |
| Education attainment n(%) | | | | | | |
| | | University | High school | Primary school | None | |
| HPNK public | 241* | 45 (18.7) | 138 (57.3) | 38 (15.8) | 20 (8.3) | |
| Private hosp. | 911* | 62 (6.8) | 543 (59.6) | 215 (23.6) | 91 (10.0) | |
| Total | 1,152* | 107 (9.3) | 681 (59.1) | 253 (22.0) | 111 (9.6) | |
| Occupation status n(%) | | | | | | |
| | | Public sector | Private companies | "Freelance" jobs | Students | Unemployed and others |
| HPNK public | 242 | 9 (3.7) | 15 (6.2) | 21 (8.7) | 25 (10.3) | 172 (71.1) |
| Private hosp. | 912* | 24 (2.6) | 106 (11.6) | 212 (23.2) | 84 (9.4) | 484 (53.1) |
| Total | 1,154* | 33 (2.9) | 121 (10.5) | 233 (20.2) | 111 (9.6) | 656 (56.8) |

* : Missing values.

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**Table 2** Distribution of the sample by clinical factors: maternal height, parity, antenatal uptake, previous cesarean section and very low birth weight

| **Maternal height (centimeters)** | | | | | |
|---|---|---|---|---|---|
| Hospital | Number | Mean | Standard deviation | Median | Wilcoxon-Rank sum p |
| HPNK (Public) | 242 | 156.8 | 6.4 | 157 | |
| Private hospitals | 911* | 156.9 | 7.2 | 157 | |
| Total | 1153* | 156.9 | 7.1 | 157 | 0.750 |
| **Parity n [%]** | | | | | |
| | | Nulli primiparas | Multiparas | | Pearson chi-squared p |
| HPNK (Public) | 242 [100.0) | 118 [48.8] | 124 [51.2] | | |
| Private hospitals | 914 [100.0) | 427 [46.7] | 487 [53.3] | | 0.571 |
| Total | 1,156 [100.0 | 545[47.1] | 611[52.8] | | |
| **Previous cesarean section n [%]** | | | | | |
| | | Yes | No | | |
| HPNK (Public) | 242 [100.0) | 23 [9.5] | 219 [90.5] | | |
| Private hospitals | 914 [100.0) | 139 [15.2] | 775 [84.8] | | |
| Total | 1,156 [100.0) | 162 [14.0] | 994 [86.0] | **0.023** | |
| **Antenatal care uptake n [%]** | | | | | |
| | | Yes | No | | |
| HPNK (Public) | 242 [100.0] | 229 [94.6] | 13 [5.4] | | |
| Private hospitals | 914 [100.0] | 879 [96.2] | 35 [3.8] | | |
| Total | 1156 [100.0] | 1,108[95.85] | 48 [4.15] | 0.285 | |

**Table 3** Association between VLBW and selected socio demographic and clinical factors (Pearson chi-squared)

| **Factor** | **Categories** | **VLBW** | | **P** |
|---|---|---|---|---|
| | | Yes n [%] | No n [%] | |
| Age (years) | <30 | 11[1.4] | 799[98.6] | 0.781 |
| | >=30 | 4[1.2] | 342[98.8] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Residence | Goma | 15[1.4] | 1,087[98.6] | 0.388 |
| | Rural | 0[0.0] | 54[100.0] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Marital status | Married | 15[1.4] | 1,058[98.6] | 0.278 |
| | Others | 0[0.0] | 83[100.0] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Education attainment | University graduated | 2[1.9] | 105[98.1] | 0.583 |
| | Others | 13[1.2] | 1,036[98.8] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Occupation status | Public sector | 0[0.0] | 33[100.0] | 0.504 |
| | Others | 15[1.3] | 1,108[98.7] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Height | <150cm | 2[1.0] | 190[99.0] | 0.732 |
| | >=150cm | 13[1.3] | 951[98.6] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Parity | Primi/ nulliparous | 5[0.92] | 540[99.1] | 0.281 |
| | Multiparous | 10[1.6] | 601[98.4] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Antenatal care uptake | Yes | 15[1.3] | 1,093[98.6] | 0.417 |
| | No | 0[0.0] | 48[100.0] | |
| | Total | 15[1.3] | 1,141[98.7] | |
| Abortions | Yes | 8[3.8] | 201[96.2] | 0.000 |
| | No | 7[0.7] | 940[99.3] | |
| | Total | 15[1.3] | 1,141[1.3] | |
| Hospital attended | Public (HPNK) | 7[2.9] | 235[97.1] | 0.014 |
| | Private sector | 8[0.9] | 906[99.1] | |
| | Total | 15[1.3] | 1,141[1.3] | |

## Discussion

The overall prevalence of VLBW at Goma main hospitals (p=1.30%) seems abnormally low if compared to data published elsewhere in Sub-Saharan Africa.[6] It seems, in fact, to be more close to those reported in developed countries especially the USA.[3] If confirmed this picture is surely more than a positive one because VLBW is associated not only to numerous newborn's somatic health problems but also to increased risk of long-term disability and impaired development and delayed motor and social development.[12,13] A logical

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and acceptable explanation of this rather singular finding was very hard to propose except the high likelihood of systematic errors during newborn's weights measurements, a problem documented elsewhere in settings comparable to DRC.[14,15] Moreover the low quality and lack of relevant information (HIV serology status, Malaria status, smoking behavior etc.) in mothers and newborns medical records made practically impossible to take account of well-known confounding factors.

However we have to point out that the prevalence recorded at the HPNK public hospital, 2.9%, is close to that of Black Americans, 2.8%, a US population sub group considered as constantly disadvantaged regarding a large set of health indicators.[3] This value probably better represents the real picture of VLBW at Goma city than that found at the local private hospitals. Our study showed that a history of abortions was strongly related to risk of VLBW (Pearson chi-squared: p=0.000) however the association disappeared once performed the logistic regression. To summarize, the prevalence of VLBW at Goma's major hospitals seems abnormally low taking account of the specific unfavorable context. No potentially relevant clinical correlate was evidenced.

Our study has a number of limits or weaknesses. They include:

i. Hospital-based rather than community-based

ii. Utilization of instruments of routine practice for weight measurements

iii. No standardization of methods and instruments for weight's measurements

iv. No gathering of information about some potentially important factors related to VLBW: HIV status, malaria status, paternal weight and height, birth order, individual and household revenues.

## Conclusion

The prevalence of VLBW at Goma city's major hospitals seems to be abnormally low however the picture found at the public hospital is probably more realistic.

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## Conflicts of interest

Author declares there are no conflicts of interest.

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