



Frequency and Early Neonatal Mortality Related to Anomalies of Birth Weight and Gestational Age in Rural Areas: A Case of the General Reference Hospital of Lubao (Lomami Province, Democratic Republic of Congo)

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Abstract

Birth weight anomalies (Macrosomy and Dysmaturity) and gestational age (pre-mature and post-term) are a real public health problem, especially in resource-constrained countries. The newborn is exposed to great morbidity and mortality. This study aims to determine the frequency and early neonatal mortality related to anomalies in birth weight and gestational age in our environment. This is a retrospective and descriptive three-year study (2011-2013) at the Maternity services of the General Reference Hospital of Lubao (Lomami Province, Democratic Republic of Congo). Out of a total of 1158 live babies retained for this study, 378 cases (32.6%) of birth weight and gestational age abnormalities were noted: 12.7% of birth and 19.9% for gestational age anomalies. Premature was much observed (n = 165 or 14.2%) followed by dysmature (n = 99 or 8.6%), post-term (n = 66 or 5.7%), and macrosomes (n = 48 or 4.1%). These anomalies had resulted in 122 cases (10.5%) of early neonatal

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deaths. Premature and post-mature were significantly more at risk of mortality than dysmature and macrosomes ($p < 0.05$). These high rates of birth weight and gestational age anomalies and their associated mortalities attest to the need for rapid and concerted control actions. Birth weight and gestational age abnormalities arise as serious health problems to which appropriate responses are required. It would require good follow-up and care for pregnancy and newborn.

Subject Areas

Nursing, Pediatrics, Public Health

Keywords

Dysmature, Lubao, Macrosoma, Premature, Post-Term

1. Introduction

The World Health Organization (WHO) sets out the groups of neonatal pathologies including neonatal infections, perinatal asphyxia, congenital malformations and birth weight anomalies (Dysmaturity, Macrosomia) and gestational age (Prematurity, Post-maturity) [1]. Anomalies in birth weight and gestational age (ABWGA) are a real public health problem, especially in developing countries where the mortality that accompanies them is high [2]-[9]. In the developing countries, the management of pregnant women and newborns poses even more problems [7] [8] [10] given the limited means and the often inadequate organization of the qualities of care, especially in rural areas [11]. This situation exposes millions of newborns in the world to high morbidity and mortality [1] [7] [11]. South-East Asia and sub-Saharan Africa cumulate neonatal mortality by nearly 60% of infant mortality and nearly 40% of infant and child mortality [12]. Anomalies in birth weight and gestational age, with prematurity in the first rank, are recognized as one of the leading causes of newborn deaths in Africa [7] [9] [10] [11]. In Africa, the majority of the population is rural and often less served by health services [7] [9] [12].

In the Democratic Republic of Congo (DRC), there are provinces where there are no gynecologists, obstetricians and pediatricians. These specialists are important elements in the care of pregnant women and children. This is the case of the province of Lomami and the territory of Lubao in particular. This situation exposes certain newborns (NB) whose clinical condition requires the expertise of the specialist (Obstetrician or pediatrician).

In the medical literature, birth weight and gestational age abnormalities are approached in isolation, so the overall weight of these pathologies seems to be ignored in neonatal medicine. This is where we come up with the idea of approaching this study. The objective of this work is to determine the overall frequency and early neonatal mortality of birth and gestational age anomalies in our environment. It will help health decision makers to get an idea about neonatal health in the territory of Lubao (DR. Congo).

2. Patients, Materials and Methods

2.1. Site of the Study

This study was carried out at Lubao Generals Reference Hospital (GRH). The Lubao GRH is located in the Lubao City and Territory, Lomami Province, Democratic Republic of Congo (**Figure 1**).

The territory of Lubao (area 22,480 Km² and population estimated at 1,580,069 inhabitants) is a deconcentrated administrative entity whose capital, located 200 km from Kabinda bears the same name. It is subdivided into four administrative areas and three health zones: Bekalebwe (Kamana Health Zone), Tshofa (Tshofa Health Zone), Lubao and Kisengwa (Lubao Health Zone). The population is predominantly of the Songe (or Ba Songye) ethnic group.

The General Reference Hospital of Lubao (GRH) is the only hospital of the Lubao Health Zone which receives all the patients of the sectors of Lubao and Kisengwa. There are three general practitioners physicians and nurses of all levels (A1, A2 and A3). The health center furthest from its areas action is one 178 kilometers (=Kafumbe health center). The maternity ward has a capacity of 20 beds and is a neonatology unit. There are no incubators or temperature incubators for newborns (NB). There are even times when some essential medicines are lacking

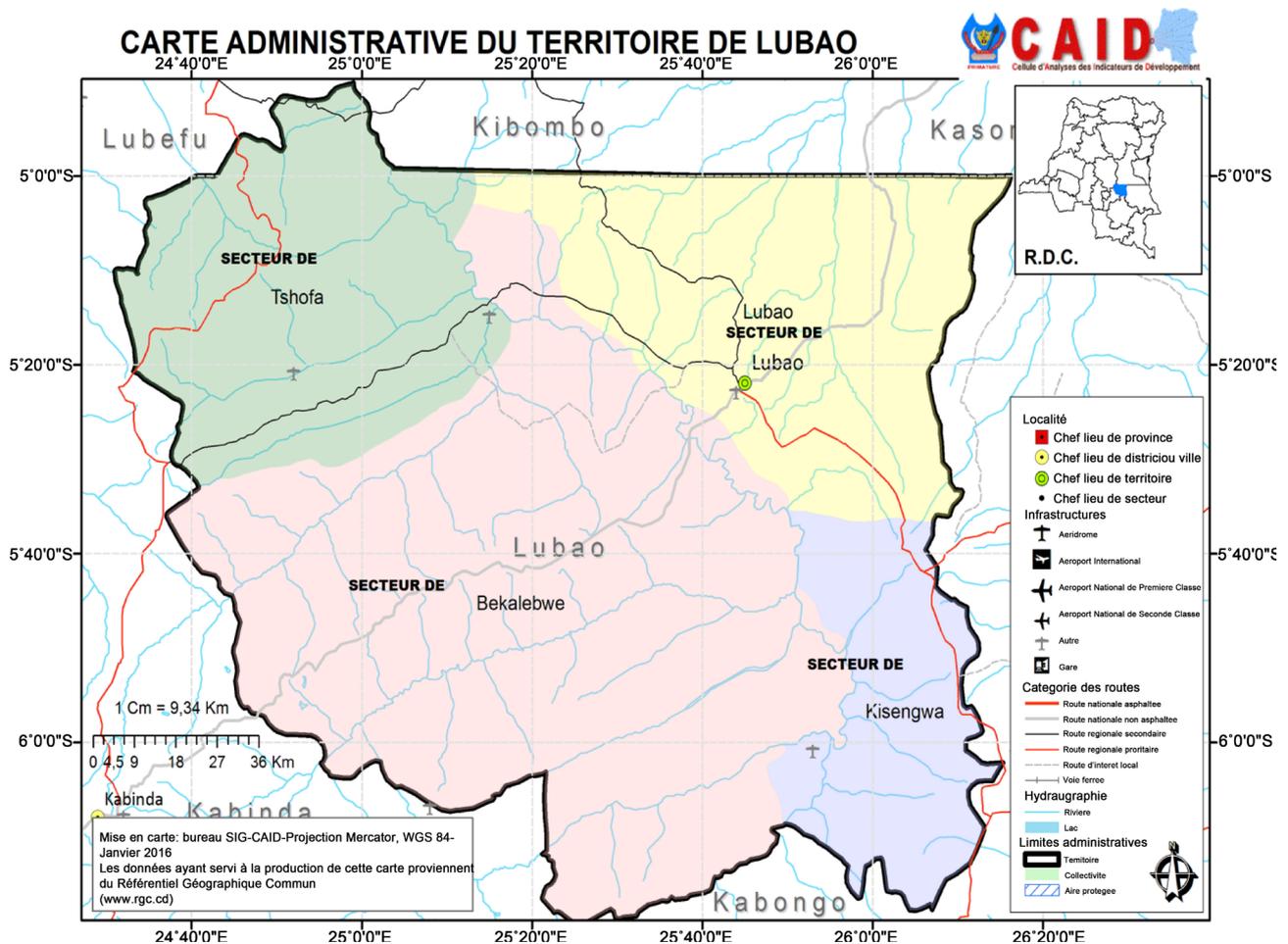


Figure 1. Map of Lubao territory, Lomami Province, DRC. Source: CAID: www.caid.cd.

and private pharmacies are needed (See www.caid.cd.index.php/data-by-province-administrative/province-of-lo).

2.2. Design of the Study

This was a retrospective and descriptive study carried out from January 2011 to December 2013, there three years. Included in this study was any newborn born from a monofetal pregnancy and whose birth weight anomalies (Macrosomia and Dysmaturity) and gestational age (prematurity and post-maturity) had been met the study parameters. The parameters studied included:

- For the mother: the date of the last menstrual period, the number of prenatal consultations (ANC), parity and age.
- For the newborn: sex, gestational age, birth weight and prognosis in the early neonatal period.

We did not widen the parameters (delivery pathways, delivery patterns, newborn size, maternal history, etc.) to look for under our objective.

To determine gestational age (GA), we referred to the date of the last menstrual period (following the near absence of ultrasound before the twelfth week of amenorrhea and during pregnancy) and the neurological and morphological maturity criteria of the newborn.

To avoid confusion that may arise in particular regarding premature infants (true, macrosomes and hypotrophic), the definitions of ABWGA in this study include:

- Macrosome [13] (fetal macrosomia): NB of birth weight ≥ 4000 g and GA ≥ 37 amenorrhea weeks.
- Premature [3] [7] [10]: NB of which GA ≤ 36 amenorrhea weeks. In this study, regardless of birth weight, premature new born was included and considered premature.
- Dysmature [11]: NB of birth weight < 2500 g and GA ≥ 37 amenorrhea weeks.
- Post-term [11]: NB whose GA ≥ 42 amenorrhea weeks.

Out of 1324 births registered in delivery registries and partogrammes at maternity service of the GRH of Lubao, 1158 NB (87.5%) were selected according to the inclusion criteria. To process the data from this study, the usual calculations including Frequency, Binomial repartition, Means and Chi-squared at significant threshold $p \leq 0.05$ were used.

3. Results

Out of a total of 1158 newborns retained for this study, 378 cases of birth weight (BW) anomalies and gestational age were recorded or 32.6%. Among the ABWG-As, gestational age abnormalities (GAA) were the most common ($n = 231$, 19.9%) followed by birth weight anomalies (BWA) ($n = 147$, 12.7%) (Figure 2).

The characteristics of the mothers of children with ABWGA revealed that most women were aged 14 to 25 years ($n = 197$, 52.1%), primiparous ($n = 147$, 38.9%) and who did not correctly follow prenatal consultations (Table 1). The mean age

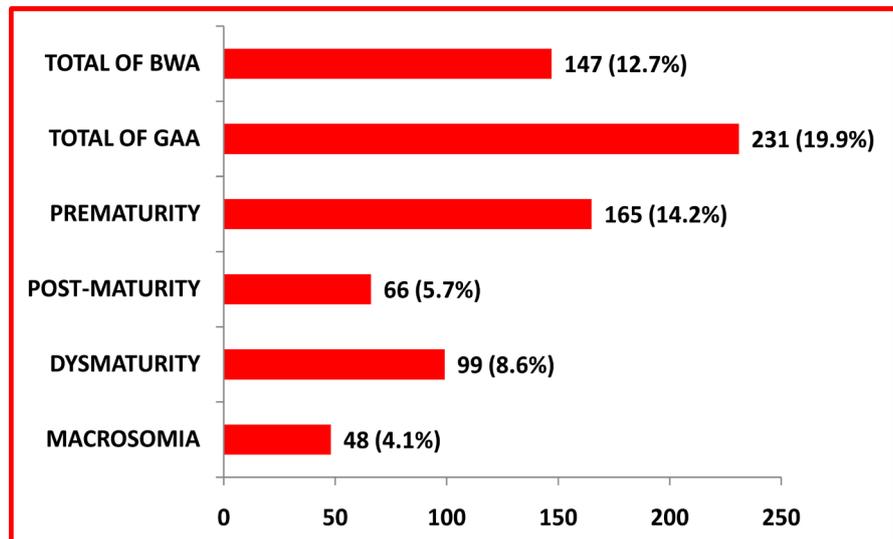


Figure 2. Types of anomalies in birth weight and gestational age among live births (n = 1158).

Table 1. Characteristics of newborns mothers with anomalies in birth weight and gestational age (Age, Parity and follow-up prenatal consultations).

| Characteristics | n | % |
|----------------------------------|-----|------|
| Age (years) | | |
| [14 - 26[| 197 | 52,1 |
| [26 - 38[| 147 | 38,8 |
| [38 - 50[| 34 | 9,0 |
| Parity | | |
| Primiparous | 147 | 38,9 |
| Pauciparous | 73 | 19,3 |
| Multiparous | 76 | 20,1 |
| Grand multiparous | 82 | 21,7 |
| Prenatal consultations or visits | | |
| No one | 89 | 23,5 |
| 1 | 67 | 17,7 |
| 2 | 89 | 23,5 |
| 3 | 110 | 29,1 |
| ≥4 | 23 | 6,1 |

Means age: 27.9 ± 1.5 ans (Sd); Extremes: 14 - 48 ans.

was 27.9 ± 1.5 years with the extremes of 14 to 48 years. No prenatal visits were followed by 89 women (23.5%). Only 110 women who had given birth followed three prenatal consultations (29.1%). Among the abnormalities of birth weight and gestational age, prematurity (n = 165 or 14.2%) was the most encountered followed by dysmaturity (n = 99 or 8.6%), post-maturity (n = 66 or 5.7%) and Macrosomia (n = 48 or 4.1%). The difference observed in the different categories

of ABWGAs (GAA and BWA) was statistically significant ($p < 0.05$) (Figure 2).

Figure 3 provides information on the sex of newborns. In 52.4% of cases ($n = 198$), NB were male whereas girls accounted for 47.6%, or 180 newborns. Compared with sex, macrosomes, post-term and prematurity were predominantly male with 56.2% ($n = 27$), 65.2% ($n = 43$) and 50.3% ($n = 83$). The difference observed between the male and female sex was statistically significant for the post-term ($p < 0.05$).

In this study, early neonatal mortality was 10.5% ($n = 122$) among live births ($n = 1158$). Premature were the most affected, followed by post-mature, dysmature and macrosome, respectively with 6.6% ($n = 77$), 2.3% ($n = 27$), and 1.3% ($n = 15$) and 0.3% ($n = 3$) (Figure 4).

GAA was significantly the leading causes of early neonatal deaths ($p < 0.05$) (Table 2 and Figure 4). Macrosomes were less concerned than premature infants (6.2% than 46.5%). Indeed, the order of early neonatal deaths was as follows: Prematurity > Post-maturity > Dysmaturity > Macrosomia.

4. Discussion

The health of the NB remains a major concern of the WHO [1] [12]. Africa is

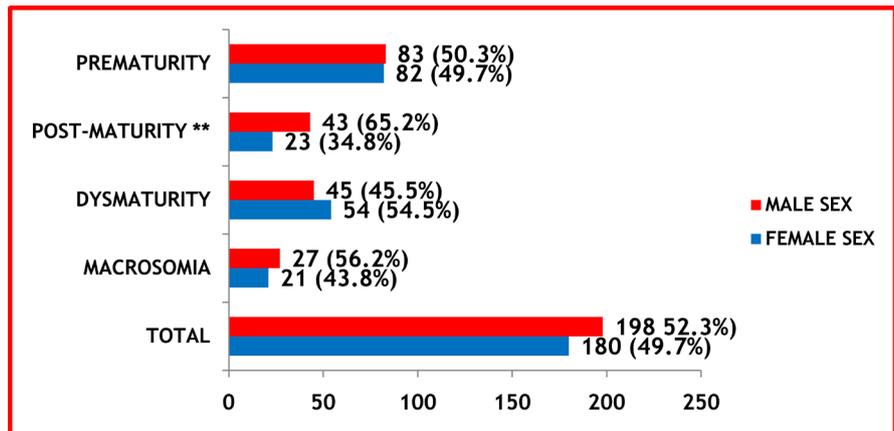


Figure 3. Gender of newborns with anomalies in birth weight and gestational age. ** $p < 0.05$.

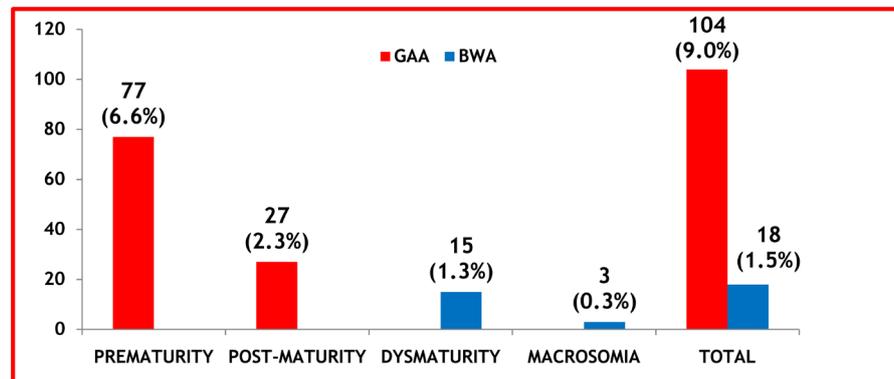


Figure 4. Prognosis of newborns with anomalies in birth weight and gestational age in relation to all births in the early neonatal period ($n = 1158$).

Table 2. Prognosis of newborns with anomalies in birth weight and gestational age in early neonatal period.

| ABWGA | Total n (%) | As well n (%) | Deaths n (%) | P |
|-------------|-------------|---------------|--------------|----|
| GAA | 231 (100) | 127 (55.0) | 104 (45.0) | |
| PREMATURE | 165 (100) | 88 (53.5) | 77 (46.5) | |
| POST-MATURE | 66 (100) | 39 (59.1) | 27 (40.9) | |
| BWA | 147 (100) | 129 (87.8) | 18 (12.2) | S* |
| DYSMATURE | 99 (100) | 84 (84.8) | 15 (15.2) | |
| MACROSOME | 48 (100) | 45 (93.8) | 3 (6.2) | |
| Total n (%) | 378 (100) | 256 (67.7) | 122 (32.3) | |

S*: The difference between GAA and BWA in death groups is statistically significant.

the continent with high birth and infant mortality rates [10] [12]. We conducted this study in women with a profile of parturients whose average age was 27.9 ± 1.5 years, mostly primiparous (38.9%) and whose pregnancy monitoring was insufficient. Our objective was to determine the overall frequency of anomalies in birth weight and gestational age in our environment. There was hardly any in-depth study of each type of ABWGA. After analyzing the results, BWA (macro-somes and dysmature) and GAA (premature and post-term) constitute a real public health problem in Lubao with 12.7% and 19.9% respectively, *i.e.* an overall frequency of 32.6%. Thus, one in three newborns carries an ABWGA. It would seem that this frequency is higher. This high frequency can be explained mainly by the poor socioeconomic conditions of a large part of the population, inadequate prenatal consultations and the high prevalence of malaria in the region. In our context, some additional factors would be associated but studies would be required. Our work is limited to determining the frequency of ABWGA. Indeed, malaria and poor follow-up of pregnancies have been incriminated in the occurrence of different anomalies of birth weight and gestational age in the world [3] [7] [8] [10] [11]. Male NBs were the most affected (52.4%) without being statistically significant. In the medical literature consulted in various search engines, no study had approached the ABWGAs as a whole. This situation limits our discussion by the fact that this study seems to be the first.

In comparison with live births, prematurity was the first ABWGA encountered (14.2%) followed by dysmaturity (8.6%), post-maturity (5.7%) and macrosomia (4.1%). The incidence of prematurity in this series of studies is close to that of certain African authors: Pambou *et al.* [4] in the Republic of the Congo 16.8%, Yed *et al.* [13] in Burkina Faso 15.88%, Chiesa *et al.* [14] in Gabon 11.8% and Balaka *et al.* [15] in Togo 11.3%. The results of Tietche *et al.* [16] 21.5%, Nagalo [3] 33.6% and Nyenga [7] 43% in the DRC were higher than what we met in Lubao. On the other hand, Cissé *et al.* [5], Kalume *et al.* [17] and Bernardi [18] had mentioned frequencies lower than our results.

The DRC is among the top 10 countries with the highest prevalence rate of prematurity despite efforts to reduce it [7].

Table 3 reports the frequencies of the different birth and gestational age anomalies according to authors and countries.

While published work on infant mortality (0 - 5 years) is readily available, this is still not the case for neonatal mortality in sub-Saharan Africa. This situation is certainly due to the failure of vital demographic data and the numerous deliveries and deaths of newborn babies at home [9].

In this study series, the mortality rate of newborns in the early neonatal period following ABWGA was 10.5%, that is to say at least one in ten newborns died after birth. This rate represents 32.3% of NB with ABWGA. The gestational age abnormalities, already mentioned more frequently, are also significantly the most affected. Neonatal mortality remains a concern for any health program [1] [10] [12] and remains an indicator of the quality of neonatal health [9] [12] [19]. In our context, it is very high and requires exceptional measures from the Ministry of Public Health and its partners. We dare to believe that the lack of necessary resources (obstetrician, neonatologist, incubator, heating table, oxygenotherapy, etc.) for the management of this fragile NB (ABWGA) would be the basis of this great mortality. Early neonatal mortality was 16% in Ivoire Coast [9] and 27.4% in Senegal [5]. The overall neonatal mortality (early and late) was 24.15% in Antananarivo (Madagascar) [19] and 16.7% in the Bukavu Provincial Hospital (DRC) [12]. No study, apart from this, shows the early neonatal mortality associated with ABWGA.

Among the newborns with ABWGA, prematurity was the first cause of NB deaths with ABWGA (46.5%) followed by post-term (40.9%), dysmature (15.2%)

Table 3. Frequency of ABWGAs in the medical literature.

| Authors | Country | Premature | Post-term | Macrosome | Dysmature |
|----------------|--------------|-----------|-----------|-----------|-----------|
| Our study | DRC | 14.2% | 5.7% | 4.1% | 8.6% |
| Iloki [20] | Morocco | | | 4.09% | |
| Laghzaoui [21] | Morocco | | | 7.5% | |
| Dias [22] | Morocco | | | | 9% |
| Djadou [23] | Togo | | | | 11% |
| Ndiaye [11] | Senegal | | | | 9.1% |
| Balaka [15] | Togo | 11.1% | | | |
| Nagalo [3] | Burkina Faso | 33.6% | 2.3% | | |
| Tietche [16] | Cameroon | 33.6% | | | |
| Kakundji [24] | DRC | | | 5.7% | |
| Mumba [8] | DRC | | | 4.4% | |
| Nyenga [7] | DRC | 43%** | | | |
| Fuchs [25] | France | 6.6% | | | |
| Butali [26] | Nigeria | 16.8% | | | |
| Ezewui [27] | Nigeria | | | 8.1% | |

** : Transferred cases from others medical centers represent 67%.

and macrosome (6.2%). This same observation was evoked by Ndiaye, Cissé, Nyenga and Mutombo [5] [7] [9] [11]. On the other hand, mortality was very low in the rank of macrosome (**Table 2** and **Figure 4**). The preterm infant is a fragile being exposed to several complications (return to fetal circulation, hypoglycemia, hypothermia, respiratory distress, peri-ventricular leucomalacia, peri-ventricular hemorrhage, hyponatremia, hypocalcemia, infections, etc.) could have a dominant role in the incidence of mortality. Mortality in premature infants (**Table 2**) is close to Ye *et al.* [13] in Burkina Faso with 40.4% but lower than Balaka *et al.* [15] 30.1% and Cissé *et al.* [5] 30.7%.

Mortality due to dysmaturity among live births in our series remains far lower than that reported by DIAS [22] in Morocco: 1.3% than 23% (but for DIAS, it was a question of the early and late mortality of All newborns regardless of ABWGA).

The frequency and early neonatal mortality of APNAG would be underestimated in our series, in case the many home births are included. Nevertheless, these results confirm the high frequency of ABWGA and the arguments that Africa in general and the DRC in particular are the places where the newborns have a higher risk of mortality [5] [7] [9] [10] [12] [19].

The proportion of ABWGAs, especially in rural areas, should be of concern to health decision-makers. Efforts to improve the survival of mothers and newborns should be encouraged. Prospective cohort studies are very necessary to complement the results of this study, particularly with regard to the association factors and fate of these children with birth weight and gestational age abnormalities.

5. Conclusion

Anomalies in birth weight and gestational age affect 32.6% of newborns and stand as serious health problems to which appropriate responses are required. The rate of early neonatal mortality (10.5%) remains very high. Efforts must be urgently made at all levels in terms of population education, monitoring and management of women from beginning of pregnancy up to the postpartum periods. The conditions for NB care, in particular those with ABWGA with predominance in the first place by prematurity, had to be improved. In waiting for the public authorities to affect the qualified personnel (specialists in neonatology and obstetrics), we advocate, in addition to the equipment to be provided for the care of the NB, the continuing training of the health personnel in the mother's health and the new-born.

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Conflict of Interest

The authors do not declare any conflicts of interest in connection with this study.

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