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Research Article

Nutritional Monitoring and Prognosis of Low Birth Weight Newborns at the Mother-Child Hospital SOS Kara from 2016 to 2017

Segbedji KAR[1]*, Geraldo A[1], Anato AC[2], TchagbeleOB[1], Azoumah KD[1], Agbere AD[3], Atakouma DY[3]

[1]*Kara Teachings Hospital, Pediatrics Department, University of Kara, Rue des Evala Kara, Kara, Togo*

[2]*SOS-Mother-Child Hospital, Pediatrics Department, University of Kara, Kara, Togo*

[3]*Sylvanus Olympio Teachings Hospital, Pediatrics Department, University of Lomé, Quartier Tokoin, Lomé, Togo*

***Corresponding Author:** Segbedji KAR, Kara Teachings Hospital, Pediatrics Department, University of Kara, Rue des Evala Kara, Kara, Togo.

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Abstract

Introduction: Low birth weight (LBW) morbidity and mortality remains high in our developing countries.

Objective: To evaluate the nutritional follow-up and prognosis of LBW newborns.

Materials and Methods: This was a descriptive longitudinal study conducted from January 1, 2016 to December 31, 2017 at the SOS-Mother-Child Hospital (SOS-MCH) at Kara. The study focused on low birth weight (LBW) newborns hospitalized during the period (birth weight < 2500g). The data studied were clinical, nutritional and developmental. These data were processed using SAS 9.4 software. An ANOVA simple test was performed for the continuous variables and that of the chi-square test with a significance threshold of 5% for the categorical variables.

Results: We identified 99 LBW newborns (22.9% of the 432 hospitalized newborns), including 39 term hypotrophs (39.4%), 60 preterm infants (61.6%), 28 of whom had associated hypotrophy (46.7%). The sex ratio was 0.8. At the end of the first week of life, 48.5% of LBWs, mainly hypotrophs, had been discharged on medical advice (p = 0.005). The mean weight growth was 21.2g ± 125 in favour of hypotrophic LBWs (p = 0.001) and gestational age ≥ 34 SA (p = 0.005). This was not the case at the end of the second week of life. The mortality rate was 15.2% after an average stay of 2.6 ± 2.1 days.

Conclusion: There is room for improvement in the nutritional and developmental prognosis of the LBW newborn at the SOS-MCH through improved technical support and kangaroo maternal care.

Keywords: *Low-Birth-Weight; Newborn; Nutrition; Outcomes; Togo*

Introduction

Low birth weight (LBW), a major public health problem due to a strong association between birth weight and morbidity and infant mortality, is a key indicator of newborn health [1,2]. According to WHO, LBW newborns (less than 2500g) represent 15.5% of live births, thus affecting 20 million newborns with frequencies that vary according to region, with 96% of these residents living in developing countries [2]. In Togo, infant-juvenile mortality was 89 ‰, neonatal mortality 27 ‰ in 2013. Newborns accounted for one-third of under-five deaths (32.3%) and 11.6% of these deaths were due to premature births and low birth weights [3]. In the Kara health region in 2016, LBWs accounted for 30.8% of hospitalized newborns, hypotrophy accounted for 34.9% and prematurity 65.1% [4]. The reduction of infant-juvenile mortality is therefore dependent on the improvement of the survival of newborns, especially premature infants and low birth weights. Thus, the survival of premature newborns, especially those with LBW, has been considerably improved thanks to the advances in neonatology. In Togo, fragmentary studies on the LBW have only been carried out in the capital Lomé (as in most developing

countries) where the technical support is a little more challenging [5-7]. It is necessary to review the situation in the northern region where the technical support is not very optimal. This is how we undertook this work at SOS-Mother-Child Hospital (SOS-MCH), one of the reference centers for the care of newborns in Kara region of the northern Togo.

Objective of the Study

Our objective is to evaluate the outcome of the management and follow-up of LBW newborns in this center. More specifically, the aim was to identify the epidemiological characteristics of these LBWs and to determine their short-term outcome at the end of their care.

Materials and Methods

This was a descriptive longitudinal study conducted from 1st January 2016 to 31st December 2017 at the SOS-MCH in Kara. One of the three reference centers for pediatric in Kara commune, 430 km north of Lomé, it serves the Kara health region. The pediatric hospitalization service consists of seven hospitalization rooms with twenty-five beds. The neonatology unit consists of six beds, four incubators, two monitors, one phototherapy device, two vacuum cleaners, one oxygen condenser and one oxygen shell. Full-time, this service is led by one doctor assisted by two senior health technicians (medical assistants), seven nurses, and five sick guards.

The study included all live LBW infants hospitalized during the study period in the neonatology unit of SOS-MCH in the Kara whose birth weight was less than 2500g (newborns with low birth weight). These LBWs included preterm infants (birth before 37 SA), infants with intrauterine growth retardation or term hypotrophic growth (weight below the 10th percentile for gestational age), and hypotrophic premature neonates. An exclusion was made for all newborns with incomplete records. The care of these newborns consisted of: specialized unit hospitalization (intensive care or resuscitation), incubation if necessary (hypothermia control), mechanical ventilation if necessary, early parenteral nutrition by the peripheral venous route, enteral nutrition by gastric tube in the absence of suction, bi-antibiotic therapy in case of proven infection, cardiorespiratory monitoring, clinical and biological monitoring, parental involvement in care (Kangaroo maternal care or KMC) for stable newborns as well as support of the parent-child relationship.

Data collection was carried out using a survey based on the medical records of hospitalized newborns. The parameters studied were newborns characteristics, clinical and evolutionary data, as well as nutritional monitoring. Data processing was done using SAS 9.4 software. An ANOVA simple test was performed for the continuous variables (presented as mean ± standard deviation or mean ± standard error). For categorical variables (expressed as numbers and percentages) a chi-square test was applied with a significance threshold level of 5%.

Results

Epidemiological and clinical aspects of low birth weight

During the two years of study, we counted 99 LBWs out of 432 hospitalized newborns (22.9%) including 39 hypotrophs (39.4%), 60 cases of preterm newborns (61.6%) among which 28 were associated with hypotrophy (46.7%). There were 54 girls (54.6%) and 45 boys (45.4%), for a sex ratio of 0.83. Regarding admission, 78 newborns (78.8%) were referred from other peripheral structures (including 5 delivered at home or on the way). The vaginal way was the main mode of delivery with 84.85%. Among the risk factors identified in 68.7% of newborns, we noted poorly followed pregnancies (30 cases), twin pregnancies (27 cases), preeclampsia (5 cases), malaria (3 cases), HIV (2 cases) and severe anemia (1 case).

Clinically, 51 LBW (51.5%) had a good clinical condition at admission, 48 (48.5%) had fever (34 cases or 34.4%), respiratory distress (10 cases or 10.1%) and seizures (2 cases or 2%). These LBWs had neonatal asphyxia in 11 cases (11.1%), a feeding problem in 36 cases (36.4%), and a probable neonatal infection in 53 cases (53.5%). These newborns were treated according to their respective pathology. Breast milk was used in 93 LBWs (93.9%) as a means of nutrition; breastfeeding was mixed in 6 cases (6.1%).

Monitoring and prognostic aspects of the first two weeks

Progressive prognosis of LBWs neonates

A breakdown of newborns by progressive prognosis (Table 1) showed that at the end of the first week, 48.5% of newborns had been discharged on medical advice, consisting mainly of hypotropic LBW at term (p = 0.005), 53.1% of premature babies always remained in

hospital. At the end of the second week of hospitalization, there was no significant difference between the different progressive prognoses of LBW neonates (p = 0.1).

Table 1: *Breakdown of newborns according to the progressive prognosis over the first two weeks. Week 1 (Chi-square = 18.59, p = 0.005); Week 2 (Chi-square = 10.63, p = 0.1)*

Period	Type of Low birth weight	Favorable in hospitalization	Favorable with exit	Death	Exit against medical advice
Week 1 (n = 99)	Premature newborns	17(17.2)	7 (7.1)	8 (8.1)	0 (0.0)
	Hypotrophic newborns	8 (8.1)	26 (26.3)	3 (3.0)	2 (2.0)
	Hypotrophic premature	9 (9.1)	15 (15.2)	3 (3.0)	1 (1.0)
	Total	34 (34.4)	48 (48.5)	14 (14.1)	3 (3.0)
Week 2 (n = 34)	Premature newborns	11 (32.4)	4 (11.8)	1 (2.9)	1 (2.9)
	Hypotrophic newborns	3 (08.8)	4 (11.8)	0 (0.0)	1 (2.9)
	Hypotrophic premature	2 (05.9)	7 (20.6)	0 (0.0)	0 (0.0)
	Total	16 (47.1)	15 (44.1)	1 (2.9)	2 (5.9)

Weight growth depending on the low birth weight types of newborns

The mean weight growth (MWG) at the end of the first week was 21.16 ± 125g with extremes of -240 and 320g: 63 LBW newborns had maintained at least the birth weight, 36 lost weight. The MWG of premature newborns in the first week (Figure 1) was -37.26 ± 17.48g, that of the term hypotrophic was 71.54 ± 22.30g and that of the hypotrophic premature infants was 15, 68 ± 19.65g. This MWG was statistically significant between the different types of low birth weight at the end of the first week (ANOVA, F = 7.44, p = 0.001).

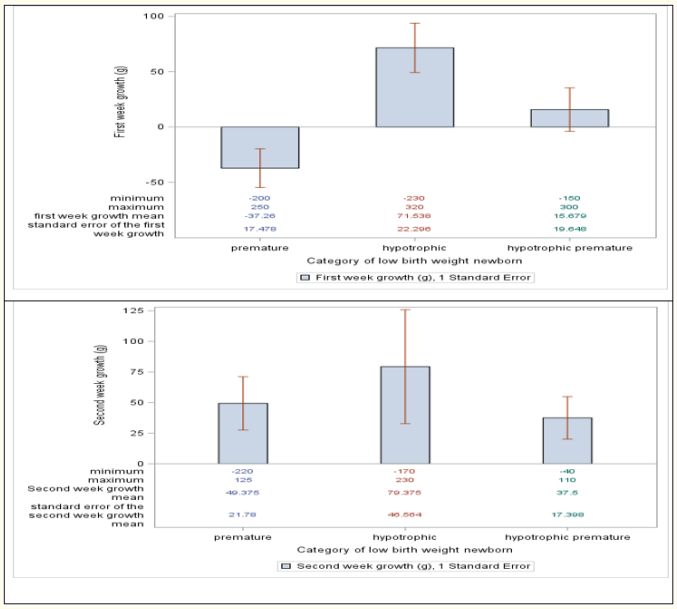

Figure 1: *Average newborns weight growth in the first two weeks (W1, W2) depending on low birth weight types.*

At the end of the second week, the MWG of the premature neonates was 49.38 ± 21.78g, that of the term hypotrophic was 79.38 ± 46.56g and that of the hypotrophic premature babies was 37.5 ± 17 40g (Figure 1). There was no statistically significant difference between mean growth in the second for different types of low birth weight (ANOVA, F = 0.44, p = 0.65).

Weight growth depending on the gestational age (GA) of newborns

The analysis in figure 2 shows a threshold of 34 GA below which there was a tendency for weight loss in the first week and above which weight gain was observed. Mean weight growth is statistically significant by gestational age in the first week (ANOVA, F = 2.49, p = 0.005). In the second week, there was a trend of weight gain with no significant difference from one gestational age to another (ANOVA, F = 0.42, p = 0.9).

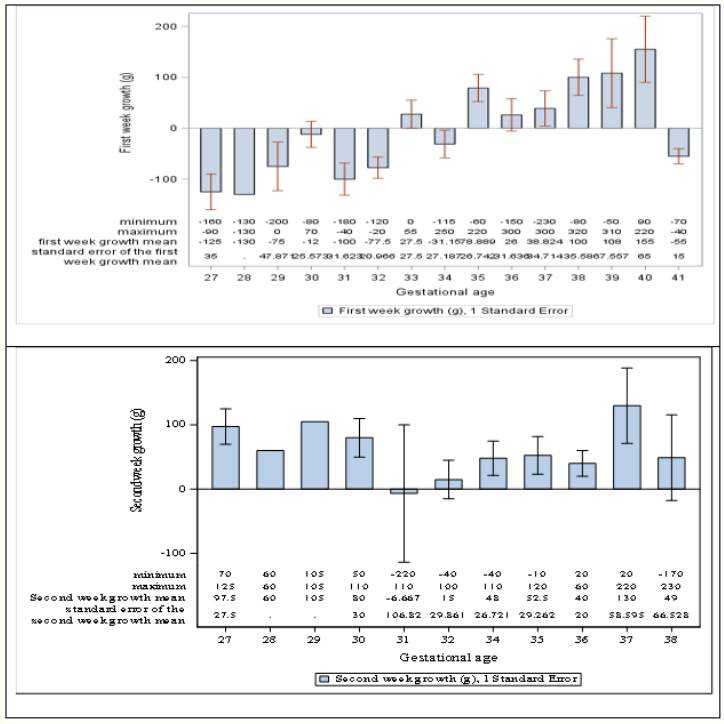

Figure 2: *Average newborns weight growth during the first two weeks of life (W1, W2) depending on weeks of pregnancy.*

Weight growth according to the type of growth in newborns

The mean weight growth in the first week was -36.15 ± 33g (CI: -101.63 to +29.33) for deceased newborns, 64.16 ± 16.9g (CI: -64.16 to + 30.44) in LBWs discharged from the hospital with a favorable evolution, 20 ± 20.70g (CI: -61.10 to -21.10) for those with favorable evolution but still in hospitalization and 20 ± 68.65g (CI: -116.30 to + 156.31) for those returning home against medical advice. There is a statistically significant difference between the different types of evolution at the end of the first week (ANOVA, F = 4.46, p = 0.0056), especially between the average weight growth of deceased LBW neonates and those released with favorable evolution (p = 0.04).

Average hospital stays according to the prognosis

The average hospital stay for newborns who died was 2.64 ± 2.11 days, 6.65 ± 1.13 days for newborns discharged with a favorable progress, 18.69 ± 1.40 days for those still in hospitalization and 9.33 ± 4.57 days for those who came out against medical advice (ANOVA, F = 19.84, p < 0.0001). There was a statistically significant difference between the average stay of deceased newborns compared to neonates still in hospital (p < 0.0001) and between hospitalized newborns and those returning home (p < 0.0001).

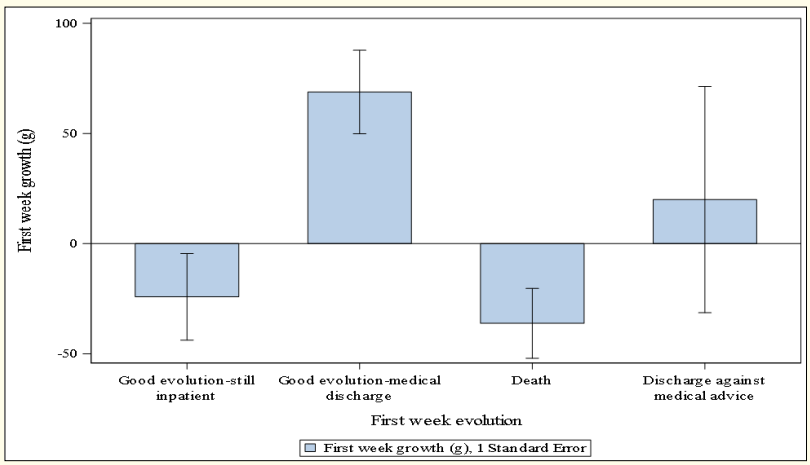

Figure 3: *Weight growth in terms of progressive prognosis at the end of the first week.*

Discussion

Epidemiological data

Our study included 99 premature newborns and term or non-term LBWs representing 22.9% of the 432 hospitalized newborns. Among these LBWs, there were 60 eutrophic premature infants (61.6%) including 28 hypotrophic premature and 39 term hypotrophic (39.4%). In 2016, LBWs accounted for 30.8% of hospitalized newborns in Kara commune [4]. At the south of Togo, this incidence ranged from 11.1% to 7.2% between 2002 and 2014 [5,6], comparable with 8.5 to 15.1% of hospital frequency of prematurity in Africa [8,9].

The mean gestational age in our study was 34 GA, a result also reported by Faye., *et al.* [10] while these LBW were close to term in Tunisia (36 GA) and Bangladesh (38 GA) [11,12]. This gestational age is the showcase of the relatively optimal monitoring of pregnancy. High and extreme prematurity are not very frequent probably due to the average level of the technical support, with the SOS-MCH being a secondary reference center.

As recorded in 2016 in 83.1% of cases [4] in Kara municipality, the vaginal way was the main mode of delivery in our series with 84.85%. The majority of LBWs in our study were referred newborns (77.8%) due to the SOS-MCH mid-level referral center position and its maternal and childcare specificity. The clinical condition of these newborns at admission determines their weight and prognosis. Neonatal infection (53.5%) and feeding (32.3%) were the main problems posed by LBW at admission. In Kara in 2016, neonatal infection was found in 55.4% of LBWs hospitalized [4]. Most LBWs in our work had benefited from breastfeeding (93.9%). The non-optimal socio-economic context and the various benefits of breast milk make breastfeeding the optimal mode of choice for the nutrition of these LBWs. This breastfeeding is associated as much as the circumstances allow the SMK with regard to its benefits and to the risk of enterocolitis, which often conditions the prognosis in these LBWs.

Nutritional and prognostic follow-up

Average weight growth by low birth weight types

The average weight growth among LBWs at the end of the first week was 21.16 ± 125 g with extremes of -240 and 320g. It is generally accepted that newborns have an initial weight loss of 5 to 10% physiologically during the first 3 - 5 days of life before recovering their initial birth weight often before the 10th day [13]. This weight loss is mainly due to water loss and cannot be interpreted as negative growth during this period. In Senegal, Faye., *et al.* found a weekly weight gain of 54.95 g/kg in LBWs [10]. In this study, premature babies had an average loss of 37.3g at the end of the first week, while term hypotrophic infants had a weight gain of 71.5g. According to Senterre, weight gain from 3 days of life is significantly higher in hypotrophic premature infants, 116.2 ± 11.6 g/kg, than in premature infants, 100.8 ± 14.7 g/kg ($p < 0.01$) [14]. The physiological immaturity of the premature child would influence his ability to feed and adapt to extra uterine life. As the diet of premature babies is dependent on their clinical condition, it is difficult for them to be early in our exercise context, especially

since more than two-thirds of them are referred. Hypotrophic premature infants generally have lower weight loss and regain birth weight faster as compared to the premature infants, often allowing them to partially limit their postnatal growth stunting.

In our work, underweight gain was more relevant for preterm infants of gestational age below 34 weeks, requiring nutritional attention and more care actively. The type of LBW, the quality of initial nutritional care in the first days of life, and an adequate quality of the technical plateau are factors likely to influence the weight growth of these newborns. Improved clinical status and nutrition often determined the rest of the growth after the first week. At the end of the second week, mean weight growth was 53.9g (7.7 g/kg/day) in our study, with no difference in types of LBW. A better daily weight gain of 17.5 ± 7.4 g/kg/day ($p < 0.01$) was obtained in hypotrophics in France during the second week of life [14]. Our activity context is marked by difficulties in optimizing nutritional intake (based mainly on breast milk) with a low technical support and limited human resources.

Evolutionary prognosis

At the end of the first week in this work, 48 LBW (48.48%) were released with a favorable prognosis, 34 (34.34%) evolved favorably but always in hospital; 14.1% had died (with many more premature, 25%). In some literatures in southern Sahara, the mortality rates of these LBWs ranged between 24.3% and 45.7%, mainly due to the high proportion of prematurity and very LBW [5,15-17]. Premature rupture of membranes, LBW or prematurity, neonatal infections, referral, neonatal asphyxia, and the early neonatal period are all significantly associated with these deaths [5,6,15,18].

The change in weight growth mean (WGM) of LBW was significantly associated with prognosis: while this WGM was negative (-36.15g) at the end of the first week for deceased LBWs, it was 20g among LBWs at home against medical advice and 64.2g at LBW who were released with favorable medical opinion. In 2016 in Kara commune, the average weight gain in LBWs discharged on medical advice after an approximate hospital stay of 6 days was 230.9g [4]. In addition, our work shows that better birth and gain weight are proportional to a lower risk of death. In fact, the mortality rate increased with the drop in birth weight. The average stay (SM) was 2.6 days for LBW newborns who died, 9.3 days for LBW discharged against medical advice and 6.6 days for those released on medical advice. In a previous study in Kara, the average stay of LBWs discharged on medical advice was 6 days and 18.7 days for those still in hospital [4]. Longer hospital stays are often dependent on high prematurity and very LBW or the severity of associated neonatal conditions [4-7,10].

Conclusion

The LBW newborns care is a real problem at SOS-MCH in Kara. Nearly one in four newborns is affected, 78% of these LBW are referred. Feeding related problems (32.3%) and neonatal infection (53.5%) were the main associated problems. Nutritional monitoring was marked by more significant weight gain in the second week (53.93%) than in the first week (21.2%). The mortality rate was high (15.2%) during the two weeks of hospitalization, with premature babies being the most vulnerable. Weight gain was correlated with a shorter duration of hospitalization. LBW newborns care in general has been limited by the insufficiency of the technical and therapeutic supports requiring a better implementation of kangaroo maternal care.

Conflicts of Interest

None.

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Contribution by Authors

Azoumah KD: Concept, analysis, editing and supervision.

Anato A: Concept, analysis, editing and supervision.

Segbedji KAR: Concept, data acquisition, analysis, editing, writing.

Tchagbele OB: Editing, proof reading.

Geraldo A: Drafting of the work, writing.

Atakouma DY: Supervision the article.

Agbere AD: Supervision the article.

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