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Medium-term outcome in a cohort of newborns with low birth weight: A prospective study about 255 case

Abstract

Aim of the study: Analyze the factors involved in the growth, height and weight in a cohort of newborn low birth weight at 6 months.

Methods: It's a prospective and analytic cohort study over 6 months. We recruited all patients with low weight whatever their feeding mode. To the output of the service a health card was given to them with their growth curve. They are then reviewed each month until the age of 6 months. At each consultation are taken anthropometric measurements (weight, height and cranial perimeter, the information on their feeding and potential morbidities).

Conclusion: Anthropometric parameters are better than those of the third world countries. The management of infants with delayed intrauterine growth is hardier. We need to accelerate the growth rate by a better nutritional care.

Keywords: Newborns; Low birth weight; Anthropometric; Feeding

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Abbreviations: WHO, world health organization; IUGR, intrauterine growth restriction; IQR, interquartile range; UNICEF, united nations international children emergency fund

Introduction

Low birth weight is an important indicator of public health due to strong association between birth weight on the one hand, and mortality and morbidity infant other. Despite tremendous progress to reduce the mortality rate childhood in Morocco, the proportion of low birth weight does not regress as quickly than expected. Prevention remains a challenge (MSSS, 2008, Policy perinatal). The nutritional management of newborn low birth weight is a constant concern in neonatology. Nutritional recommendations for children with very low birth weight issued by the European and American Committees pediatric nutrition match the weight of a normal fetus gain in the third trimester of pregnancy. The question therefore arises whether we have done, nutritionally, as well or as worse than the intrauterine life with our current health care especially in our centers where the means of support are often lacking. To answer this question, we conducted a study that aimed to analyze the factors involved in weight gain and growth in a cohort of newborns of low birth weight supported and monitored health in a service of medicine and neonatal resuscitation.[1,2]

We conducted a prospective study in 2009 that was interested in analyzing the anthropometric parameters at birth and near of term of a cohort of premature, studying the factors involved in the development of postnatal growth restriction. Our current work aims to study these parameters in a cohort of premature and low birth weight at the age of 6 months and study the prevalence of late extrauterine growth in the two groups, the factors involved and the associated morbidities.

Patients and methods

Population

We conducted a prospective cohort study from 1 May 2013 to 30 October 2013. We recruited patients with low weight who survived, whatever their feeding mode. During hospitalization, their growth was regularly monitored as well as their nutritional intake and the various morbidities developed. At the output of hospitalization a health card was given to them with their growth curve. They were then reviewed each month until the age of 6 months. At each consultation anthropometric measurements (weight, height and PC) were taken. We noted the informations related to their feeding mode and the potential associated morbidities. Again, were obtained the informations concerning the identity of the newborn, its origin, date of birth, gestational age and initial age at entry to the service. Were also identified characteristics and those of the mother during pregnancy, pathologies associated with such a context infectious or the occurrence of gestational hypertension.

Inclusion criteria were

i. Babies born alive at the CHIS of Rabat before 37 weeks' gestation (as determined by LMP and ultrasound dating) between the first of November 2012 and the first of April 2013.

ii. Children born with intrauterine growth restriction (below the 10th percentile compared with growth curves for age growth).

Exclusion criteria were

i. Death of children during hospitalization or during the first months of life.

ii. Severe neurological or digestive pathology contraindicating the oral feeding.

iii. Malformation or metabolic pathology.

Definition of terms

i. Newborns weighting less than 2500 grams are considered low weight.

ii. Is considered premature birth which took place before 37 weeks' gestation (WHO, 1990).

iii. A newborn with delayed intrauterine growth restriction (IUGR) is a newborn whose weight is below the 10th percentile of standard birth weight for gestational age according to the curves of Leroy-Lefort.

iv. Food survey focused on breastfeeding and its duration, methods of weaning, the rhythms of food intake, the intro- production of liquid food for children not weaned, the intro- production of semi-solid or solid foods in addition to breastfeeding for children during weaning and diversity food for children weaned.

v. Exclusive breastfeeding is the feeding mode using exclusively breast milk without involving liquid or solid food.

vi. The artificial feeding is to feed the child by artificial milk.

vii. The mixed feeding is feeding the breast milk and the artificial milk.

viii. Food diversification corresponds to the administration of food other than milk.[3]

ix. Was considered anemic, any child with a hemoglobin less than 9 g/dL at 6 months of life.

Statistical analysis

The statistical software SPSS Version 18.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The level of statistical significance was considered when $p < 0.05$. Continuous data were presented as mean. When data did not obey a normal distribution, data were reported as medians and interquartile in (IQR). A comparison of continuous data was performed using Student's T test. Discrete data were described in frequency and percentage. Comparisons of categorical characteristics were performed by a chi-square test. A logistic regression analysis was used to investigate the relationship between the presence of comorbidities and potential predictive variables. Correlations between clinical and demographic characteristics, as well as the feeding method were investigated by Pearson correlation test. Parameters with significant correlations were tested by multivariate regression analysis. Continuous data with a distorted distribution were transformed into logarithm before use in the regression model data.

Results

Description of the general population

Two hundred fifty-five children were included 44.7% of girls and 55.3% boys. The mean birth weight was 1691.49 grams +/- 372.5. The average weight was 1780 g +/- 120. The average 6-month weight was 4971g +/- 2209. The average size was 53, 27 cm +/- 8.2. The average head circumference was 39.47 cm +/ - 4.4. Nineteen percent of infants were from Rabat, 40% of Sale, 20% of Temara, the rest were from other regions of Morocco. Fourteen percent of children were breastfed exclusively for 6 months, 52.9% received mixed feeding, 8.2% artificial feeding and 24.7% were diversified (Table 1).

Description of the premature population

51% of premature infants had a GA between 34 and WG 37 WG. 37% of patients had a GA between 32 and 33.9 WG. 1% of births were less than 32 weeks who survived till six months. The exclusive breast feeding was observed in 20% of patients at 6 months. The boys had 65% of the population (Table 2). More than 80% of premature had achieved a normal weight for age at the output of the service according to the Lefort curves (Table 3). Over 90% of premature had achieved a normal weight for age 6 months depending on the WHO charts (Table 4). There was a high prevalence of premature from disadvantaged neighborhoods of Rabat-Temara compared to other parts of our service area (Table 5&6).

Table 1 Descriptive statistics of various parameters studied in the entry, exit and at 6 months (N = 255). GA: Gestational Age; BW: Birth Weight; EW: Exit Weight; AW: Average Weight at 6 months; AA: Actual Age; HC: Head Circumference; S: Size

Parameters	Average	Standard deviation
GA admission	2,75	699
AA admission	4,44	3,190
BW	1691,49	3,72,483
AW	4971,06	22,09,686
EW	1990	3,50,452
S birth	53,57	8,226
HC birth	39,473	44,231

Table 2 Distribution of children according to gestational age GA (weeks of amenorrhea)

AG	Number	Percentage
GA <32	2	8
32<GA<33,9	96	37,6
34<GA<35,9	121	47,5
36<GA<37	36	14,1

Table 3 Description of the parameters studied in the population of premature infants (N = 222)

Parameters	Average	Standard deviation
GA	34,75	1,67
BW	1651,38	272,5
Weight (6months)	4981,13	1309,9
EW	1780	198,5
S (6 months)	54,88	2,2
HC (6 months)	38,67	2,42

Table 4 Exit premature trophicity.

Trophicity	Number	Percentage
Normal Weight for age	200	90%
Intrauterine growth retardation	22	10%
Extrauterine growth retardation	0	0%
Total	222	100%

Table 5 Trophicity of the prematures at 6 months

Trophicity	Number	Percentage
Normal Weight for age	200	90%
Extrauterine growth retardation	22	10%
Several Extrauterine growth retardation	0	0%
Total	222	100%

Table 6 Univariate analysis: Meaning association

	Confidence intervals at 95%	p	
Relative Risk (RR)			
Rabat	0,62	0,53 - 0,73	<0,01
Temara	2,96	1,4 - 6,2	0,03

Description of the population of intrauterine growth retardation iugr

The dominant male is 56%. 30% of infants had severe IUGR. 70% of infants had a moderate IUGR. Breastfeeding exclusive was

observed in 10% of cases. Over 93% of IUGR had not caught a normal weight for age at the output of the service according to the WHO charts (Table 7). More than 50% of IUGR had achieved a normal weight for age 6 months depending on the WHO charts (Table 8). The infection was found more among former IUGR with a significant difference. Anemia was not a significant association (Tables 9–11).

Table 7 Description of the parameters studied in the population of IUGR (N=33)

Parameters	Average	Standard deviation
BW	1850,58	142,5
W at 6 months	4651,11	1520,8
EW	1870	155,7
S	52,56	2,1
HC	35,67	1,42

Table 8 Trophicity IUGR at the output of the service

Trophicity	Number	Percentage
Normal Weight for age	2	63%
Intrauterine growth retardation	20	60%
Several Intrauterine growth retardation	11	33,3%
Total	33	100%

Table 9 Trophicity IUGR at 6 months

Trophicity	Number	Percentage
Normal Weight for age	17	51%
Extrauterine growth retardation	15	48,7%
Several Extrauterine growth retardation	1	3%
Total	33	100%

Table 10 Comparison of trophicity at 6 months between preterm and IUGR

	GA (medium)	BW (medium)	EW (medium)	% (sortie)	%EUGR (6months)	% breastfed
IUGR	38	1850	1870	93,3%	51,7%	10%
Preterms	34,75	1651,4	1780	19%	10%	20%
P	NR	0,58	1,13	0,01	0,04	0,7

Table 11 Morbidity at 6 months: comparison of two groups (preterm and IUGR)

Signs	Preterms	IUGR	P
Anemia	22	8	1,09
Seborrheic dermatitis	18	2	1,13
Infection	7	10	0,05
Strabismus	5	0	2,12

Discussion

Despite the importance of the sample studied and the parameters measured in this study, there have been limitations and biases related to several interrelated factors. Clinical monitoring was performed at 6 months of life and previous nutritional conditions have not been taken into account, it was difficult technically in our context; it would be necessary to study precisely the parameters of children in 1st, 2nd and 3rd months real age; other hand, a large number of children was lost. Patients received parenteral nutrition for 1 month in 76% of case, they obtained the complete food self-sufficiency at 33 days of life in 65 % of cases.

Premature birth, delayed intrauterine growth, or both can result in low birth weight. Premature birth is a birth that occurs before 37 completed weeks of pregnancy (WHO, 1990). A newborn with a delay of intrauterine growth retardation (IUGR) is a newborn whose weight is below the 10th percentile of standard birth weight for gestational age. With against another definition is accepted for IUGR: a newborn with a delay of intrauterine growth is a baby born at term (≥ 37 weeks) but with low weight (<2500 g). In industrialized countries, prematurity is the leading cause of low birth weight. About two thirds of low birth weights are also premature. Low birth weight is relatively more common among women in deprived conditions. Among vulnerable groups, low weight is between due to other intervening factors such as poor diet, high prevalence of infections, complications of pregnancy and working conditions unfavorable.

The identification of low birth weight children at birth is highly dependent on the growth curve of reference used. Thus, the curves of the "ideal" reference established at birth growth should concern only a population of newborns from pregnancies without pre-existing maternal diseases or fetal damages of a region or country;[3,4] For the study, we chose to refer to the curves of Leroy and Lefort. Our study showed that from a disadvantaged background, poor socio-economic conditions, physical and psychological stress are all purveyors of prematurity and IUGR factors. Bobossi et al reported a higher rate of premature in the poorest Togolese people. Tall et al. also showed the same observation in a population of Dakar.[2,5] The average birth weight was below the European standards and was very slightly higher than the limit of the average weight of 1500g accepted as a middleweight in the developing countries. The average weight of our study was higher than that found in three studies conducted in southern Togo by Atakouma. This difference in birth weight can be explained by socio-economic, climatic and nutritional factors.[2,6]

Low birth weight, prematurity and IUGR are usually associated with various risk for postnatal health: lower average growth, respiratory problems, neurological problems, blindness, deafness, behavioral problems and learning difficulties (MSSS, 2008, Policy perinatal). Preterm birth is the leading cause of death, morbidity and disability among observed newborns. Late intrauterine growth are usually associated with disorders of physical and cognitive development. The role of a low weight at birth is recognized in the occurrence of chronic diseases in adulthood, including obesity, hypertension, diabetes and cardiovascular disease (UNICEF and WHO, 2004; Kramer, 2000).

Recent studies have suggested that postnatal growth retardation is inevitable since it has been shown that premature infants born before 30 weeks gestational age had multiple energy deficit of 800 kcal / kg and protein deficit of about 23 g / kg for the first five weeks of life.[6]. It is also known that several factors influence the nutritional status of children of low birth weight in the medium term, they are three orders: those who hold to the original status of the child: maternal context, pathology of pregnancy, mode of delivery , initial GA ; those who hold to the postnatal illness of the child, both in the initial period (hyaline membrane disease, perinatal infection...) and secondarily (necrotizing enterocolitis, nosocomial infection); those that are directly related to the nutritional protocol followed at home, this element is not quite controlled in our context (negligence of sight...). In this study, nutritional factors have escaped our control, despite a mass awareness for the benefit of breastfeeding, less than 15% of

mothers used it exclusively. This could be explained by social and professional considerations. At the end of meet the high requirements of this category of newborn enrich breast milk is essential. However, we have not yet in Morocco the human milk fortifiers.

Susceptibility to infections was more noted in IUGR, Morsine had noted and explained by the prolonged defense systems dysmaturity in low birth weight.[7,8] Thrive on the catch, American studies body composition show that the catch occurs during childhood or adolescence, the percentage of the catch is higher in a former preterm population as of low birth weight and catch-up this late is performed completely independently of the type of early nutrition received by the child. Our series showed no significant relationship between nutritional protocol to medium term and the decrease of growth restriction at 6 months in the 2 groups. In fact the average height and weight for age were not influenced by mode of feeding. If until now, the short-term growth index was the most used, it is important, in light of the literature data, to focus on other factors in the medium or long term.[9–12] Three options for the neonatologist: the first is to quickly deliver nutrition during the first days and weeks of life in order to limit the occurrence of late extrauterine growth; the second is to revise the requirements to promote catch-up growth before the release of neonatology; the third is to promote a catch thrive late.

Conclusion

Given recent evidence of metabolic, nutritional and epidemiological, it is perhaps prudent for clinicians to focus on improving early nutrition, and reduces this period responsible for the occurrence of late extrauterine growth. The management of infants with delayed intrauterine growth is more difficult, it's not just a question of nutrition, the role of genetic and environmental factors are apparently important. Continued follow-up of these patients until the age of two years will identify future candidates for treatment with growth hormone.

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Conflicts of interests

None.

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