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ORIGINAL ARTICLE

Weight decrease in full-term newborns in the first 48 hours post natal

Descenso de peso en recién nacidos a término en las primeras 48 horas post natales

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Abstract

Introduction: It is known that the newborn (NB) presents weight loss immediately after birth. The magnitude of the weight loss is a controversial subject and there are no data in our sphere**. Objectives:** To determine the percentage of daily weight decrease in healthy full-term newborns in the first 48 hours of life. To specify whether factors such as gender, type of delivery, adequacy for gestational age, and use of milk formula influence weight loss. **Patients and Method:** Prospective study in healthy full-term newborns with ≥ 37 weeks of gestational age during their stay in the nursery (puerperium). Weight data were collected at birth, 24 and 48 hours after birth, and the percentages of weight loss were calculated from the daily nursing record. In addition, gender, type of delivery, adequacy to the birth and type of feeding of the NB, either exclusive breastfeeding, artificial formula or mixed (breast milk and formula) were recorded. To standardize the measurements, weights were expressed in grams and subsequently the percentage of weight loss was calculated in relation to the birth and the previous day. The maximum percentage of weight loss per day variable was analyzed. A multivariate regression model was performed for the weight loss percentages evolution. **Results:** 2960 NB were analyzed. The average weight loss on the first day was 4.43% (SD: 1.96), the second day 2.51% (SD: 1.86) and the total loss at 48 hours was of 6.85% (DS: 1.92). The determining factor in weight loss was the type of delivery. The NBs by cesarean section showed a greater weight loss in the first 24 to 48 hours. The use of milk formula determines a smaller weight loss in the NB compared with those fed with breast milk (BM). **Conclusions:** The percentage of weight loss per day of the NB in our center is similar to that reported in the international literature. Cesarean delivery is the factor associated with greater weight loss. The use of milk formula results in less weight loss.

Keywords:
Postnatal weight loss; exclusive breastfeeding; neonates; jaundice

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Introduction

Most healthy newborns show a period of weight loss right after birth[1]. This weight loss during the first days of life is something known; its cause and magnitude are subject to controversy[1,2]. It is suggested that on average children lose 4%-7% of their birth weight[3] and that they recover it around the third day of life[4].

Breastfed newborns are only fed with small amounts of liquids during the first days of life[5,6], therefore they tend to lose weight before the weight increase occurs[7,8]. Excessive weight loss can be a sign of a low milk supply or of insufficient milk transference[9,10]. The most common way to evaluate if breastfeeding is effective and efficient is to weigh the newborn during its stay in the nursery (postpartum period)[11,12]. Data based on the evidence related to the weight loss of the newborn during the first days of life are limited[10].

The Mother-and-Baby-Friendly Initiative, which was enacted by the OMS in cooperation with UNICEF, recommends exclusive breastfeeding during the hospitalization of the newborn and that no formula or water should be added[13.14].

In breastfed newborns, the enteral intake is low during the production period of colostrum, and therefore the initial weight loss after birth is almost universal[15-17]. Even though this short period of low enteral intake and weight loss is well tolerated by most newborns, some of them develop complications due to weight loss, such as hyperbilirubinemia and dehydration[18-21].

It is essential to identify what is considered as normal weight loss in the newborn since it will give doctors more information, which can help to make a well-grounded decision of adding additional milk formula to breastfeeding.

The main objectives of this study are: to determine the percentage of daily weight loss of healthy newborns during their stay in the nursery (postpartum period) and to specify if gender, type of birth, gestational age, adequacy for gestational age, and use of milk formula affect the loss of weight.

Patient and Method

Design

Prospective cohort study. Data gathered from two periods were analyzed: from November 2010 to January 2011 and from January 2014 to March 2014. The following newborns were excluded: term newborns younger than 37 weeks of gestational age and newborns who stayed in the nursery with their mother for at least 48 hours. All patients were born in the maternity unit of Clínica Dávila, Santiago. Two different periods of time were analyzed in order to increase the size of the sample and to avoid sampling bias. There were no variations in the management of the patients during both periods.

Nursery, or postpartum period, is the clinical instance where newborns are cared for and monitored, from their birth to their discharge. During this period, the patient stays with their mother in a single or shared room for 24 hours. He or she is also under monitoring by midwives and paramedic technicians trained in couplet care.

The following newborns were excluded from the analysis: all preterm newborns, multiple pregnancy, and patients that required hospitalization in the neonatology unit.

Clinical data

Birth weights were recorded at 24 and 48 hours after birth. All weights were measured with the same digital weight scale, Seca 334, which was calibrated daily as standard of service. Data were gathered every day from the daily nursing reports. In addition, the following data were recorded: gender, type of birth, birth adequacy, and type of feeding (exclusive breastfeeding, artificial formula or mixed feeding).

Regarding the use and indication of artificial formula, there are no policies or protocols on the use of supplements in our Clinic and the indication of artificial feeding was made according to individual medical criteria without influences, from the researchers, on the decision.

Ethical aspects

The Scientific Ethics Committee became aware of the study and approved its development in Clínica Dávila and allowed the registration of data from the patients and the subsequent publication of the results.

Statistical analysis

The data were analyzed with STATA 13.0 software. In order to standardize measurements, weights were recorded in grams and then the percentage of weight loss in relation to birth weight and last day weight was calculated. The maximum percentage of daily weight loss was analyzed. A multivariate regression model of the evolution of weight loss percentages was performed.

Results

The total sample was of 2,960 newborns, 1,149 from the 2010-2011 period and 1,822 from the 2014 period. The average gestational age was 38.78 weeks, ranging from 37 to 41 weeks (SD: 0.954). The type

of birth showed that 51.93% are cesarean, 40.27% are normal delivery and 7.81% are assisted delivery (forceps). The distribution according to gender was 50.74% males (table 1).

Regarding adequacy, 83.18% were adequate for gestational age (AGA), 10.51% were large for gestational age (LGA) and 6.3% were small for gestational age (SGA) (table 1). None of the previously described variables showed differences in both periods (gestational age, type of birth, gender and adequacy for gestational age).

From the sample, 1,151 (39.39%) newborns received exclusive breastfeeding (EBF) during their stay in the nursery, 1,809 (61.66%) newborns received formula one or more times (Table 1). A higher percentage of newborns received EBF in the first period than in the second period (54.05% and 29.27%, respectively), which is statistically relevant.

The weight loss analysis of the studied sample showed that during the first 24 hours the average weight loss was 4.43% (SD: 1.96), the weight loss on the second day was 2.51% (SD: 1.86) compared to the first day and the total weight loss during the first 48 hours was 6.85% (SD: 1.92) compared to the birth weight (figure 1). By analyzing each period, the results were similar: in the 2010-2011 period, the weight loss during the first 24 hours was 4.4% (SD: 2.03), the weight loss on the second day was 2.49% (SD: 1.96) compared to the first day and the total weight loss during the first 48 hours was 6.85% (SD: 1.95) compared to the birth weight, while in the 2014 period, 4.42% (SD: 1.92) weight loss during the first 24 hours, 2.52% (SD: 1.79) weight loss on the second day and a 6.86% (SD: 1.9) total weight loss during the first 48 hours, compared to the birth weight.

After analyzing which studied factors affect weight loss, the multivariate study of the first 24 hours shows that there was no significant difference in any of the studied variables (table 2).

The analysis of the period between the 24 and 48 hours of life shows that newborns who are fed with artificial formula lose more weight than newborns fed with EBF (P = 0.033); newborns delivered by cesarean lose more weight than newborns delivered by normal delivery (P = 0.000). Male newborns lose less weight than female newborns (P = 0.000). SGA newborns lose less weight than AGA newborns (P = 0.000). Gestational age also shows a statistical difference, the higher the gestational age, the lower the weight loss (P = 0.006) (table 2).

The total weight loss analysis of the first 48 hours of life shows that there were no statistical differences in gender, gestational age, and adequacy for gestational age. However, there were differences in the type of birth and use of artificial formula, since newborns

Table 1. General Characteristics of the 2960 FTN

Variables		No. of Patients	Percentage
Gestational age			
(weeks)	37	248	8.38
	38	916	30.95
	39	1,058	36.00
	40	679	22.94
	41	59	1.99
Type of delivery			
	Vaginal	1,192	40.27
	Cesarean	1,537	51.93
	Spatula	147	4.97
	Forceps	84	2.84
Gender			
	Female	1,458	49.26
	Male	1,502	50.74
Adequacy			
	Adequate	2,462	83.18
	Large	311	10.51
	Small	187	6.32
Type of feeding			
	Breast	1,151	38.89
	Formula	1,809	61.11
	Total	2,960	100.00

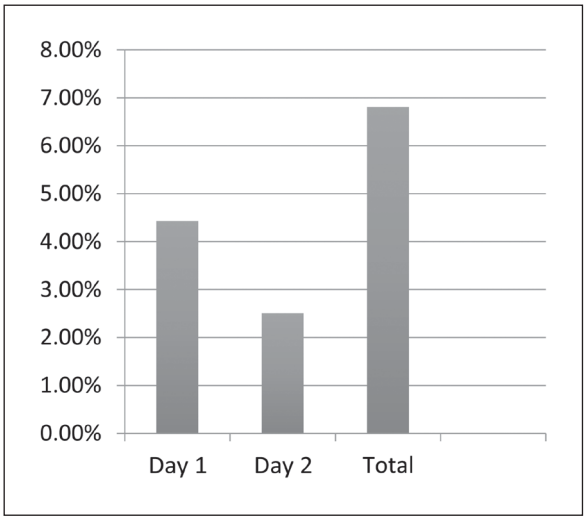

Figure 1. Percentage of Weight Loss on Postnatal Days One and Two.

Table 2. Factores analizados en la pérdida de peso

	Day 1 Coefficient	p	Day 2 Coefficient	p	Total Coefficient	p
Mixed Feeding	466.712	p < 0.1	-0.1520745	p < 0.05	0.2482842	p < 0.05
Cesarean	673.5744	p < 0.1	-0.7251474	p < 0.01	-0.2004924	p < 0.05
Males	667.7991	p < 0.1	0.2465522	p < 0.01	0.0247866	p < 0.1
Adequacy						
SGA	-337.0152	p < 0.1	0.8487974	p < 0.01	0.3432167	p < 0.1
LGA	-612.9448	p < 0.1	-0.0520678	p < 0.1	-0.0074705	p < 0.1
> Gestational age	484.1344	p < 0.1	0.099387	p < 0.01	0.0285867	p < 0.1

delivered by cesarean lose more weight than newborns delivered by normal delivery (P = 0.039) and newborns fed with formula lose less weight than newborns fed with EBF (P = 0.039) (table 2).

Discussion

This study shows that healthy newborns experience a 6.85% average weight loss in the first 48 hours of life, which is similar to what is reported in international literature[2,3,10,17,28]. The first studies that reported this phenomenon were made by Masiels et al.[22] in 1980, where they reported a 6% average weight loss in the first three days of life[22] and in a second study, they reported a 6.86% average weight loss, but did not indicate if it happened in two or three days[3]. Furthermore, these findings came from studies performed in newborns that were made to evaluate neonatal jaundice and risk factors which influence their development; therefore, there is bias regarding the chosen population and those studies do not have the required amount of patients to estimate precisely the normal limits of weight loss during the first days of life. In later studies performed by Chantry et al.[23], they report a 5.8% ± 3.7% loss on the third day[23].

The percentage of weight loss analysis provides the following data: the highest percentage of weight loss occurs on the first day of life, an average of 4.43%; a lower weight loss occurs on the second day, an average of 2.81% compared to the first day. A systematic review by Noel-Weiss et al.[10] which included 11 studies performed on healthy term newborns, fed with exclusive breastfeeding, determined that the average weight loss varies from 5.7% to 6.6%, with a 2% standard deviation, the higher percentages of weight loss appeared on the second and third day after birth; the studies incorporated in this review are difficult to compare, since there are different statistical descriptions to express the weight changes[10].

After analyzing the risk factors that affect weight loss, we found that the type of birth is a decisive factor in the weight loss of newborns. Delivery by cesarean was a decisive factor in higher weight loss between the 24 and 48 hours of life and in the total weight loss during the first 48 hours of life. These findings coincide with what was reported by Maganaro et al.[21], where the association between delivery by cesarean and a higher weight loss was described[21]. Delivery by cesarean has been described as a risk factor for suboptimal breastfeeding, a delay for the start of breastfeeding[24-26] and excess weight loss[21]. Regnault et al.[27] showed that a newborn delivered by cesarean was 2.42 more likely to have excess weight loss[27]. These findings indicate that pre-birth factors, such as dehydration, can affect the postnatal weight loss of breastfed newborns[23,28]. The higher weight loss is associated with an intravenous fluid overload in mothers undergoing cesarean delivery with the subsequent over-hydration of NB, which contributes to increased weight loss[29]. Chantry et al.[23] reported that the relative risk of newborns who lost >10% of their birth weight increased three times when women had a balance of more than a 200mL/h positive liquid during the intrapartum period[23]. Watson et al.[30] suggested the existence of intravenous liquids threshold received by the mother during birth, which affects the newborn weight loss. Therefore, the volume of intravenous liquids is a factor which contributes to the early weight loss of newborns during the first 48 hours of life[30].

Regarding the use of formula in our study, after analyzing the period between 24 and 48 hours, it was observed that newborns fed with formula had a higher weight loss than newborns fed with EBF[2,29,31]. Maisels et al.[3] determined that newborns fed with breastfeeding lost a 6.86% ± 2.97% average of their birth

weight, while newborns fed with formula lost 4.24 ± 2.88% (P < 0,02). Macdonald et al.[17] demonstrated that breastfed newborns lose more weight and recover their weight slower than newborns fed with formula. The results analyzed regarding the use of formula may seem contradictory when comparing both periods, we found that newborns fed with formula had a higher weight loss than breastfed newborns after analyzing the 24-48 hours. This could be explained by an inverse causality since newborns often lose an excess of weight, the first approach is to supplement breastfeeding with formula, and therefore, the use of formula will be a consequence of the weight loss and not its cause. On the other hand, Fonseca et al.[2] determined that breastfed newborns did not lose weight, which indicates that breast milk is enough to support the growth of the newborns during the first hours of life; in contrast, newborns fed with formula or mixed feeding were more likely to have a sub-optimal weight loss, which could indicate overfeeding[2].

After analyzing the risk factors in the 24-48 hour period, it was observed that male SGA and GAG newborns had a lower weight loss than female AGA and SGA newborns. Marten at al[29] stated that birth weight may be an important factor in weight loss in the immediate neonatal period, presenting a positive association with the weight loss[27]. Fonseca et al.[2] determined that an insufficient weight loss is associated with birth weight, newborns who weigh <2,500g were 2.68 times more likely to lose weight[2]. This can be due to a recovery of growth, which could produce an increased growth in comparison with the normal rates for that age after a period of conditions that inhibit growth, which is common in SGA newborns[32]. Chapman and Pérez-Escamilla[24] found a higher risk of delayed breastfeeding in mothers whose newborn weighed less than 3.6kg (8 lb)[24].

After analyzing the studied risk factors and evaluating in which way they affect weight loss, the multivariate analysis of the first 24 hours shows that there was no significant difference in any of the analyzed variables. This can be explained by the absence of some variables in our study, such as labor time, the amount of administrated fluids and anesthesia doses, which have been demonstrated in literature to affect weight loss[9,23,30] and can be especially considered risk factors of weight loss in newborns during the first 24 hours of life.

This study has the limitation of not having considered variables related to the mother, such as parity, previous breastfeeding experience, labor time, type of anesthesia, which have been described as risk factors associated to higher weight loss[21,28]. Another limitation is that it did not consider the use of fluids during the intrapartum period, where the administration would cause an expansion of the fetal volume and determine a higher weight loss[23].

The strength of this study is the sample size. The birth weight was recorded as a habitual procedure in the clinical practice and all weight measurements were performed prospectively, which reduces recall bias.

A protocol that addresses and evaluates weight loss during the first 48 hours of life should always take into consideration factors that in our study lead to a higher risk of presenting high weight loss, such as the type of birth, gender, gestational age and adequacy for gestational age.

Conclusion

It was possible to determine the percentage of daily weight loss of newborns in our center. The percentage of daily weight loss of newborns in our center was similar to what has been reported in international literature. Cesareans are a factor which are associated with higher weight loss. The use of milk formula determines lower weight loss in newborns.

The results of this study strengthen the need for attention and special follow-ups of couplets with the risk of presenting excess weight loss after birth.

We believe that the appropriate use of our data will help to substantiate interventions, such as supplementing formula.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

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Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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