Original Research Article

Significant weight loss and hypernatremia in exclusively breast-fed neonates

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ABSTRACT

Background: Weight loss in the early neonatal period is a problem that often goes unrecognized. Weight loss of upto 5-7% of birth weight is normal but losses more than 10% may result in increased morbidity, especially hypernatremia.

Methods: Prospective cohort study of 900, exclusive breastfed inborn babies, >34 weeks gestation and >1800g born in a tertiary care hospital in South India. Babies who were discharged before 96 hours of life, admitted to intensive care and received phototherapy for >24hrs were excluded. Maternal and neonatal variables were collected, and daily weight loss percent was calculated. Data was entered in EPI-INFO and analysed. Independent sample t test was used to compare the means of two independent normally distributed sample groups, ANOVA was used to compare means of more than 2 variables, linear logistic regression was used to find out the relationship between significant weight loss and hypernatremia

Results: The mean birth weight of the cohort was 2937±438.4 g and the gestational age was 38±5weeks. The mean maximum weight loss for the entire cohort was 178.71g (±82.08 g) and the mean percent weight loss was 6.12% (2.69). The mean weight nadir of the entire cohort was 2758.32±425.67g. Mean serum sodium levels for all babies who lost >10% of their birth weight was 145.95 (±2.34) mmol/L

Conclusions: Early neonatal weight loss is a universal phenomenon though often unrecognized. Babies losing more than 10% of birth weight are at risk of morbidities like hypernatremia.

Keywords: Exclusively breast fed, Hypernatremia, Weight loss

INTRODUCTION

Weight loss in the early neonatal period is well recognized but has not received due cognizance by the Pediatric fraternity. Neonates receive only small amounts of fluids in the first days following birth and they tend to lose weight before they begin to gain weight.¹ Excessive weight loss or inadequate weight gain can be indications of low milk production or of insufficient milk transfer. To ensure adequate intake and to avoid inappropriate supplementation, parents and professionals need evidence to assess patterns of neonatal weight change and to make decisions about infant feeding.

Prospective studies indicate normative weight loss to be 5% to 7% of birth weight, peaking on day 3 after birth.² A 10% weight loss is considered as an indication for further evaluation by a health care professional.³ The American Academy of Pediatrics section on breastfeeding states that “weight loss in the infant of greater than 7% from birth weight indicates possible breastfeeding problems”.⁴ The American Academy of Breastfeeding Medicine protocol, hospital guidelines for the use of supplementary feedings in the healthy term breastfed neonate, acknowledges that although weight loss of 8% to 10% can be normal, it is an indication for careful assessment and possible breastfeeding assistance.⁵

Dehydration and consequently hyponatremia and hyperbilirubinemia are devastating complications seen in breastfed babies.^{6,7} A search of literature revealed that most studies have been retrospective in nature in spite of this being a common problem.⁸⁻¹²

Hence this prospective study aimed to study the association between hyponatremic dehydration and excessive weight loss in exclusively breast-fed neonates of ≥ 34 weeks gestational age.

METHODS

This prospective cohort study was carried out in the postnatal ward of Pondicherry Institute of Medical Sciences over a period of 17 months (November 2012 to March 2014) among 900 babies who satisfied the following inclusion criteria.

Inclusion criteria

- Inborn,
- Gestational age ≥ 34 weeks,
- Birth weight more than 1800 grams,
- Babies exclusively breast fed.

Exclusion criteria

- Admitted to neonatal intensive care unit,
- Discharged before 96 hours of life,
- Received phototherapy for more than 24 hours.

The parameters studied were birth weight, daily follow up weight till 96 hours of age and at discharge, maximum and percent weight loss till 96 hours, serum sodium levels in all babies who lost $>10\%$ of their birth weight.

The study protocol was presented to the Institutional Review Board and ethics committee approval was obtained. Written informed consent was obtained from the mothers for using their baby's de-identified data.

Babies satisfying the inclusion criteria were weighed naked on a calibrated infant weighing scale within one hour of birth and every day between 12-2 pm, before feeding and at the time of discharge.

One infant weighing scale (Phoenix BWS 101, accuracy 5 g) was calibrated and dedicated for the entire period of study. Data was collected for frequency of breast feeding, urine and stools everyday till discharge.

Babies losing more than 10% of their birth weight at any point till discharge were investigated for serum electrolytes, urea, creatinine and further investigations were done as dictated by their clinical condition.

Maternal variables (age, parity, mode of delivery, timing of first feed, number of feeds per day, associated complications in the mother) and infant variables (gender,

growth category, birth weight category, no. of feeds/day, no. of times urine voided per day and no. of times stools passed per day) were documented for each case.

Daily weight loss percent was calculated using the formula:

Weight loss percent = $[(\text{birth weight} - \text{present weight}) / \text{birth weight}] \times 100$.

Definitions

Late preterm

Babies with gestational age ≥ 34 to <37 weeks gestation.

Term

Babies with gestational age 37 to 42 weeks gestation.

Significant weight loss

Weight loss more than 10% of their birth weight anytime till 96 hours of age.

Hyponatremia

Serum sodium levels >145 mEq/l.

Statistical analysis

Data was entered in EPI INFO statistical software and analyzed using SPSS version 20 for windows software.

Data analysis included independent sample t test to compare the means of two independent normally distributed sample groups, ANOVA test was used to compare means of more than 2 variables, Linear logistic regression was used to find out the relationship between significant weight loss and hyponatremia.

RESULTS

Total of 1443 deliveries took place at Pondicherry Institute of Medical Sciences during the period of study. Of these, 900 were included in the study after elimination based on inclusion and exclusion criteria (Table 1).

The mean birth weight of the cohort was 2937 ± 438.4 g and the gestational age was 38 weeks.

The mean maximum weight loss for the entire cohort was 178.71 g (± 82.08 g) and the mean percent weight loss was 6.12 (2.69). The mean maximum weight loss in late preterms was 162.97g (± 82.13 g) and the mean percent weight loss was 6.39 (2.68).

The mean maximum weight loss in terms was 181.27g (± 82.08 g) and the mean percent weight loss was 6.07

(2.68). The mean weight nadir of the entire cohort was 2758.32±425.67 g. 10.6% (97/900) babies lost >10% of their birth weight and 21.4% (193/900) lost between 7-9.99% of their birth weight.

73% (71/96) of babies who had more than 10% weight loss developed hypernatremia (Serum Na >145mmol/L).

78.9% (15/19) of late preterm babies with >10% weight loss developed hypernatremia compared to 72.7% (56/77) of term babies.

Mean serum sodium levels for all babies who lost >10% of their birth weight was 145.95(±2.34) mmol/L, mean serum sodium levels for late preterms was 145.74(±2.56) compared to 146.11(±2.32) in terms and the difference was not statistically significant.

Linear logistic regression showed statistically significant association between significant weight loss and hypernatremia with a p value of 0.002.

Table 1: Maternal demography.

Variables	Late preterm n = 126	Term n = 774	All n = 900
Age (years)			
<25	63 (50%)	378 (48.8%)	441 (49%)
25-30	57 (45.2%)	340 (43.9%)	397 (44.1%)
>30	6 (4.8%)	56 (7.2%)	62 (6.9%)
Gravida			
Primi	72 (57.1%)	409 (52.8%)	481 (53.4%)
Multi	54 (42.9%)	365 (47.2%)	419 (46.6%)
Mode of delivery			
Normal	78 (61.9%)	521 (67.3%)	599 (66.5%)
Instrumental	11 (8.7%)	35 (4.5%)	46 (5.1%)
LSCS	37 (29.4%)	218 (28.2%)	255 (28.4%)
Timing of first feed			
< ½ hour	1 (0.8%)	26 (3.4%)	27 (3%)
½ - 1 hour	106 (84.1%)	623 (80.5%)	729 (81%)
>1 hour	19 (15.1%)	125 (16.1%)	144 (16%)
Complications			
Present	81 (64.3%)	321 (41.5%)	402 (44.7%)
Absent	45 (35.7%)	453 (58.5%)	498 (55.3%)

Table 2: Neonatal demography.

Variables	Late preterm n = 126	Term n = 774	All n=900
Gender			
Male	84 (66.7%)	415 (53.6%)	499 (55.4%)
Female	42 (33.3%)	359 (46.4%)	401 (44.6%)
Growth			
AGA	98 (77.78%)	634 (81.91%)	732 (81.34%)
SGA	17 (13.49%)	131 (16.93%)	148 (16.44%)
LGA	11 (8.73%)	9 (1.16%)	20 (2.22%)
Urine/ day			
3-6 times	45 (35.7%)	314 (40.6%)	359 (39.9%)
7-9 times	71 (56.4%)	422 (54.5%)	493 (54.7%)
>9 times	10 (7.9%)	38 (4.9%)	48 (5.3%)
Stools/day			
1-3 times	45 (36%)	318 (41.1%)	363 (40.4%)
>-4 times	81 (64%)	456 (58.9%)	537 (59.6%)
No. of feeds/day			
<8/day	2 (1.6%)	16 (2.1%)	18 (2%)
8-10/day	96 (76.2%)	505 (65.2%)	601 (66.7%)
>10/day	28 (22.2%)	253 (32.7%)	281 (31.3%)

DISCUSSION

Breastfeeding is a universal phenomenon, but surprisingly little attention is paid to weight loss in the early neonatal period. The Baby friendly hospital initiative has been implemented with great vigor in many countries due to the obvious benefits of breast milk.¹³

The mean neonatal weight loss in breastfed infants has ranged from 5.5% to 7.4% in various studies.¹⁴ Despite adequate measures to ensure proper lactation many centers have reported malnutrition, failure to thrive and hypernatremic dehydration in exclusively breast-fed neonates.¹⁵⁻²⁰ This has been attributed either to inadequate feeding or high sodium content in breast milk. Hypernatremia is a devastating condition infrequently recognized in apparently healthy neonates.^{7,6} In one study babies with hypernatremia were found to have weight loss ranging from 8-30% of birth weight.⁹

Infant sodium level ranged from 146 mmol/L to 207 mmol/L with a mean of 161 mmol/L. In another study by Manganaro et al of neonates with weight loss of >10% of birth weight, 36% presented with serum sodium exceeding 149 mmol/L.²¹ In the series studied by Bhat et al among 157/496 who developed significant weight loss, 31.8% developed hypernatremia. In this study 900 neonates born over a 17 months period were followed up to 96 hrs after birth.¹⁵ Late preterms had a greater percentage of weight loss as compared to term babies. We found there were 96/900 (10.7%) with more than 10% weight loss.

Of these 77/774 were term babies with an incidence of 9.94%. Among the late preterms, 19/126 (15.07%) had severe weight loss. The incidence of hypernatremia among babies who lost >10% birth weight was 71/96 (74%). In late preterms hypernatremia was 15/19 (78.94%) and among terms was 56/77 (72.7%). None of the serum sodium values reached above 151 mmol/L. This could be due to overzealous weight monitoring and action taken by our neonatal team.

The limitations of the present study were that babies were only followed up till 96 hours, follow up weight was not done till birth weight was regained. As we are a baby friendly hospital, no control group was available to compare the morbidities in formula fed babies.

CONCLUSION

Early neonatal weight loss is a universal phenomenon though often unrecognized. Babies losing more than 10% of their birth weight are at risk of morbidities like hypernatremia. Very few prospective studies have addressed this problem especially in late preterm babies. In this study 900 neonates born over a 17 months period at the Pondicherry Institute of Medical Sciences were followed upto 96 hours after birth. 71/96 (74%) of babies who had more than 10% weight loss developed hypernatremia (Serum Na >145mmol/L). 15/19 (78.9%) of late preterm babies with >10% weight loss developed hypernatremia compared to 56/77 (72.7%) of term babies but the difference was not statistically significant. Linear regression shows positive association between significant weight loss and hypernatremia.

Recommendations

The recommendations from the present study is that daily weighing should be the standard of care in all hospitals to detect significant weight loss and its associated comorbidities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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