FACTORS AFFECTING EARLY WEIGHT GAIN OF PRETERM BABIES ADMITTED IN SULAIMANI NEONATAL CARE UNIT

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Submitted: 18/8/2019; Accepted: 21/8/2020; Published: 21/9/2021

ABSTRACT

Background

Prematurity is a term used for neonates born before 37 weeks of gestation; it is a leading cause of neonatal mortality. Preterm birth deprives the fetus of nutrient transfer in the third trimester, particularly amino acids, fats, and minerals. Preterm birth is therefore associated with significant nutritional deficits.

Objective

To assess the weight change of neonates delivered prematurely and admitted to the neonatal care unit (NCU).

Patients and Methods

In a prospective study, 99 neonates who were delivered prematurely and admitted to NCU were included; antenatal and intrapartum history was taken, APGAR score, weight at the time of admission was taken. Then, at the 3rd, 7th, 10th, and 14th days of admission, weight was measured again. Finally, the amount of feeding was calculated based on the type of feeding, including breast milk, formula, and mixed.

Results

Weight loss can be seen with all types of feeding, but is more with breastfeeding ($p< 0.05$), the survival rate was highest among breastfed and mixed, however, more than 90% of formula milk neonates survived ($p < 0.05$). The correlation between gestational week and survival and discharge was significant. ($P < 0.05$).

Conclusion

Weight loss is more in babies receiving breast milk but least in neonates on formula feeding. Another factor, such as gestational age, might affect these findings. We need further research with a larger sample size and longer duration to estimate weight change in preterm neonates, including multiple centers.

Keywords: *Neonatal care unit (NCU), Preterm, Weight change, Breast milk, Formula milk.*

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https://doi.org/10.17656/jsmc.10316

INTRODUCTION

Prematurity is a term used for the broad category of neonates born at less than 37 weeks gestation [1]. An infant's birth weight is the first weight recorded after birth, ideally measured within the first hours after birth, before significant postnatal weight loss. Low birth weight (LBW) is defined as a birth weight of less than 2500 g; globally, it is estimated that 15–20% of all births, or >20 million newborns annually, are low birth weight infants [2].

The preterm infant faces various physiologic problems like inability to coordinate sucking, swallowing, immature gag reflex, lack of body fat stores causes decreased ability to maintain body temperature and may predispose to hypoglycemia [3].

Nutritional management of the preterm or LBW baby most often targets increasing calorie consumption to promote appropriate growth; such management involves careful selection of the volume and caloric density of formulas used as well as supplementation of vitamins and minerals known to be deficient in preterm infants, premature birth alone is not necessarily the direct cause of feeding difficulties and poor growth. Feeding difficulties may reflect the perinatal complications of premature birth and the direct and indirect consequences of the subsequent medical procedures and treatment experienced by the preterm infant. For example, in contrast to healthy, full-term infants, preterm and LBW infants frequently experience feeding challenges secondary to structural, neurologic, cardiorespiratory, metabolic, and behavioral factors [4].

The growth rate is highest during the early period of infancy when balanced concentrations of these elements and minerals are imperative. Rapid, early growth rates assist in the development of organ systems in childhood, which requires a balanced diet rich in minerals and nutrients. Minerals are vital in many critical bodily functions, e.g., enzymatic reactions, bone mineralization, and protection of cells and lipids in biological membranes. Low intake or reduced bioavailability of minerals may lead to deficiencies, which may in turn cause impairment of bodily functions [5].

The study aims to assess the weight change of the Preterm neonates in the neonatal care unit in the First Two Weeks of life.

METHODS

In a prospective study, 99 neonates who were born prematurely and admitted into NCU of Maternity Teaching Hospital/Sulaimani were included in this study. Antenatal history of having gestational diabetes, hypertension, and any other related diseases were asked and retrieved from the documents available in the unit. Antenatal and Intrapartum history of use of any medication, like aminophylline, CPAP, adrenaline, and use of surfactants were taken.

APGAR score was assessed at 5 minutes, and the weight of neonates at birth was measured; the weight of neonates was measured on the 3rd, 7th, 10th, and 14th days. Neonates had different types of diet, including formula, breast, and mixed type. The amount of milk taken was measured for each neonate.

This study was conducted from November 2017 -November 2018.

Ethical consideration regulated by the ministry of higher education and ministry of health was applied during the conduction of this study.

Data analysis was done using Statistical Package for Social Sciences (SPSS) version 20. T-test was used to compare means and chi-square for finding correlation at the statistical level of 0.05.

RESULTS

This study includes 99 preterm babies who were admitted to the NCU. The mean gestational age at which they were delivered was 30.84 weeks with a standard deviation of 2.74 weeks; 60 cases had a gestational age between 26-31 weeks at the time of delivery. The gender distributions of the babies included 49 (49.5%) males and 50 (50.5%) females. Most of the mothers (97%) had more than three types of medication, but only 3% had two types of medication used; the medication used were: ibuprofen, adrenaline, surfactant- CPAP, ventilation, aminophylline, and intravenous fluids.

Regarding the type of delivery, 54 (54.5%) cases were delivered by standard vaginal delivery, but the caesarian section delivered 46 (45.5%) cases.

APGAR score was assessed at 5 minutes; more than 50% of cases had an APGAR score of more than 6. Table 1.

In the history of any gestational illness of the mother, the majority of cases had no disease, which was about 92%, 1 case had both gestational diabetes and hypertension, 2 cases had hypertension, and four cases had gestational diabetes after delivery babies were assessed for the presence of any neonatal illnesses—Table 2.

The mean weight change was highly significant in the three types of feeding at 3rd, 7th, 10th, and 14th days, $P < 0.05$. The extent of weight loss was more significant among breastfed infants, $P < 0.05$. Table 4.

The mean duration of feeding was different among different groups, for the group who were on formula, the mean duration of feeding was 5.34±3 minutes; for the group who were on breast milk mean duration of feeding was 4±2 minutes, and for the group who were on mixed feeding mean duration was 7.50±3.6.

The amount of milk taken in milliliter was different. It can be seen in table 5, in addition to the number of calories, fat, carbohydrates, and protein that constitute the milk.

At the end of the study, all of the cases (9 cases) who were on breastfeeding and mixed type of feeding survived. Among cases (90 cases) on formula (71) were discharged and (9 cases) passed away, $P < 0.05$.

Table 1. APGAR score at 5 minutes

APGAR SCORE	Frequency	Percent
1	2	2.0
4	1	1.0
5	4	4.0
6	17	17.2
7	16	16.2
8	26	26.3
9	21	21.2
10	5	5.1
Total	92	92.9
Missing System	7	7.1
Total	99	100.0

Table 2. Presence of neonatal illness

Respiratory problem	4 cases (4%)
Jaundice	31 cases (31.3%)
Convulsion	4 cases (4%)
Patent ductus arteriosus	4 cases (4%)
Atrial septal defect	4 cases (4%)
IUGR	2 cases (2.02%)
Down syndrome	2 cases (2.02%)
Poor feeding	8 cases (8%)
Hypoglycemia	1 case (1.2%)
Hypotonia	1 case (1.2%)
Poor reflex	1 case (1.2%)
Ventricular septal defect	1 case (1.2%)
Hypocalcemia	1 case (1.2%)
Vomiting	1 case (1.2%)

***The day of starting feeding in Table 3.**

Table 3. Day of starting the feeding according to the type of milk taken.

Type of feeding		Frequency	Percent
Not taken by day 10	**not yet**	3	3.4
Breast Milk	not yet	3	3.4
	first day	17	19.5
	second day	27	31.0
	third day	20	23.0
	fourth day	8	9.2
	fifth day	7	8.0
	six day	4	4.6
	ninth day	1	1.1
	Total	**87**	**100.0**
Formula milk	first day	2	40.0
	second day	1	20.0
	third day	1	20.0
	sixth day	1	20.0
	Total	**5**	**100.0**
Mixed	second day	2	50.0
	third day	1	25.0
	sixth day	1	25.0
	Total	**4**	**100.0**

Table 4. Mean weight change concerning the type of feeding

Type of feeding		Mean	Std. Deviation
Formula	Weight at birth in Kg	1.712	± 0.557
	Weight at10thday	1.146	± 0.373
	Weight at14thday	0.982	± 0.360
Breast	Weight at birth Kg	1.700	± 0.514
	Weight at10th day	0.900	.
	Weight at14thday	0.700	.
Mixed	Weight at birth Kg	1.650	± 0.369
	Weight at10th day	1.400	.
	Weight at14th day	1.000	

Table 5. Mean amount of intake concerning the type of milk

Means	formula	Breast feeding	Mixed
Mean amount of milk	186.73±77.5	189.67±120.6	180.25±74.2
Mean duration of feeding	5.34±3 minutes	4±2	7.50±3.6
Mean of Calories	513.5±211	140.35±89.2	495.6±204
Mean of carbohydrates	13.81±5.7	13.27±8.44	13.3±5.4
Mean of protein	2.42±1	15.1±9.6	2.34±0.96
Mean of fat	6.3±2.6	7.5±4.8	6.1±2.5

***This calculation is made based on the calculation that 100cc of breast milk has: 74 calories,4% fat,8%protein,7% carbohydrates. Formula milk: Calories: 275, protein1.3%, fat3.4%, carbohydrates 7.4%**

DISCUSSION

Preterm deliveries may experience different nutritional deficiencies and loss of weight. Many studies have been done so far to tackle this issue. In the current study, it can be found that neonates' loss of weight was significant, especially in the breastfed group. Dancis et al.[4] study is still a reference for assessing preterm infant growth in current neonatal care. Other studies [5-9] have used several methodologies to evaluate preterm infant growth. Assessing weight gain dynamics during the first weeks of postnatal life in preterm newborns has provided valuable data [10, 13-14].

In the study done by researchers in Brazil, the objective was to examine body weight as a growth indicator using a longitudinal and prospective approach to current neonatal care conditions, taking into account the methodological differences that hamper comparisons between studies, basically because of markedly diverse infant populations and neonatal care changes primarily due to developments in nutrition. The result showed that the growth curve was characterized by weight loss during the 1st week (4-6 days) ranging from 5.9 to 13.3% (the more significant the percentage, the lower the birth weight), recovery of birth weight within 17 and 21 days, and increasingly higher rates of weight gain after the 3rd week. These rates were proportional to birth weight when expressed as g/day (the lowest and the highest birth weight neonates gained 15.9 and 30.1 g/day, respectively). During the 3rd week, the lowest and the highest weight newborns gained 18.0 and 11.5 g kg-1 day-1, respectively) [15].

In another study performed in Iran by Islami et al., in a prospective cohort study, all LBW preterm neonates who were admitted to Shahid Sadoughi Hospital NICU in 2008 followed up for one year, and their weight, height, and head circumference were evaluated at ages of 6 and 12 months. Exclusive breastfeeding infants had the lowest frequency of underweight at the age of six months. Frequency of underweight at the age of six months and NICU stay days were more in neonates with a birth weight of less than 1000 gr [16]. Another study was done in Canada: Growth and descriptive data of preterm infants (23 to 31 weeks) from birth through 10 weeks post-term age were collected in three cities in Canada and the USA between 2001 and 2010 (n=977). Preterm infants were grouped by gestational age into 23–25, 26–28, and 29–31 weeks. Comparisons were made between the weight data of the preterm cohort and the fetal-infant growth reference. The growth velocity of the preterm infants decreased in a pattern similar to the decreased velocity of the fetus and term infant estimates, from a high of 17–18 g/kg/day between 31–34 weeks to rates of 4–5 g/kg/day by 50 weeks in each gestational age group. The most significant discrepancy in weight gain velocity between the preterm infants and the fetal estimate was between 37 and 40 weeks; preterm infants grew more rapidly than the fetus[17].

However, it is difficult to find studies to review with the same objective of the current study. However, in the current study, it was found that the neonates admitted lost weight during the period of study. However, this weight loss was accelerated for the neonates on the breast milk, more than mixed type and followed by formula. It makes sense if we consider the number of calories that are present in formula milk.

Conclusion and Recommendation

Throughout the study, neonates admitted to NCU lost weight but the amount lost was highest for breast milk and least for formula. The survival rate was more for the neonates on breast milk and mix of breast and formula milk. Larger sample size may be necessary over a more extended period to have a better estimate of neonatal weight change in neonates who have been admitted to NCU.

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