

Original Research Article

Early weight trends in preterm babies post discharge

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ABSTRACT

Background: Prematurity is the major determinant of morbidity and mortality in newborns. Infants born preterm are at increased risk for impaired growth. The postnatal growth pattern is dependent on biological factors like birth weight, gestational age, sex and intrauterine growth. The present study was undertaken to study the risk factors associated with the preterm delivery and to study the weight gain pattern among the preterm neonates after NICU discharge for a period of one month. Aims and objectives to study the risk factors associated with preterm and to analyze the weight gain pattern of the preterm till one-month post NICU discharge.

Methods: A total of 40 preterm were included during the study period of 2 months, the various maternal risk factors were studied and correlated with preterm delivery. The neonatal complications were studied. The neonates were divided on the basis of their gestational age and birth weight. They were then followed for a period of 1-month post NICU discharge.

Results: There was significant correlation of lower gestational age with neonatal complications and prolonged duration of hospitalization. The weight gain pattern was highly variable with a maximum gain of 188 gm after first week of NICU discharge. Weight gain was significantly more in first week after discharge amongst neonates who had birth weight less than 1.5 kg and also the total weight gain was significantly more in neonates who weighed less than 1.5 kg at birth.

Conclusions: Lower gestational age group 28-32 weeks was significantly associated with neonatal complications and prolonged duration of hospitalization. Immediate follow up of the preterm is necessary as there is wide variability in the weight gain pattern in various gestational age groups.

Keywords: Gestational age, Hospitalization, Neonatal complications, Prematurity, Variability

INTRODUCTION

Prematurity, defined as birth before 37 weeks gestation, is the major determinant of morbidity and mortality for newborns.¹ Preterm births account for 75% of perinatal mortality and more than half the long-term morbidity.²

LBW and prematurity are the second leading causes of infant mortality after congenital anomalies. Fortunately, in the recent decade, perinatal mortality has significantly

reduced in developed countries following increased use of prenatal steroids, surfactant and noninvasive and invasive respiratory support. Postnatal growth of infants is different from in-utero growth for various reasons which include extrauterine environment and varied nutritional requirement. The further growth of the preterm in terms of weight gain is extremely crucial for their survival and wellbeing. The care of LBW infants has improved over the years with continuing changes in medical and nutritional management.^{3,4} Despite this improvement, they continue to suffer growth lag during

neonatal period.⁵ Infants born VLBW are at increased risk for impaired growth. The postnatal growth pattern is dependent on biological factors like birth weight, gestational age, sex and intrauterine growth. Information on normal weight gain has important clinical implications. It gives health workers a valuable adjunct in the assessment of the clinical state of an infant in resource poor settings where the capacity for alternative investigations is extremely limited.⁶ In view of these changes, there is a need to study the pattern of their postnatal weight gain. There are a few studies done like the ones by a Chinese study Li et al, who have assessed the long-term growth pattern of preterm but there have been very few studies which have assessed short term follow up of preterm NICU graduates.⁷ Hence this study was done to assess the immediate post NICU discharge weight gain pattern of preterm.

Aims and objectives of this study are to study the risk factors associated with preterms. To analyze the weight gain pattern of the preterms in first month of life.

METHODS

This was a retrospective study which included a total of 40 preterm neonates admitted in the NICU. The period of study was 2 months. Informed consent was taken from the parents of the neonate. Ethics committee permission was taken.

Inclusion criteria

- Preterm between 28-36 weeks were included.

Exclusion criteria

- Patients having major congenital anomalies were excluded.
- Those whose records were incomplete, who expired on follow up and who were lost to follow up were excluded from the study.

The various causes in the form of maternal and neonatal risk factors were studied. These included maternal morbidity indicators like preeclampsia, prolonged leaking per vagina and neonatal morbidity indicators like twin pregnancy, RDS, sepsis.

Growth pattern

The preterm were divided into small for gestational age and appropriate for gestational age on the basis of their birth weight and height plotted on Lubchenco growth chart. Their serial weights were monitored with the help of Fenton growth charts.⁸

The mean duration of hospitalization was 10 days. Weight at discharge, 1 week, 2 weeks and 3 weeks after discharge were taken.

Feeding policy

Preterms were started on expressed breast milk. Once the feeds tolerated were more than 100 cc per kg human milk fortifiers were added. To those with extreme low birth weight and very low birth weight, the aim was to give a calorie requirement of 180 kcal/kg. Post discharge also similar policy of expressed breast milk was followed. Statistical analysis was done using chi square test and t test, p value <0.05 was considered significant.

RESULTS

As seen in Table 7, lower gestational age (28-32 weeks) was significantly associated with increased neonatal complications and prolonged hospital stay. (p<0.05). SGA group of preterms had a higher incidence of neonatal complications as compared to AGA group of preterms. However, this difference was not statistically significant. Similarly, lower gestational age was associated with a higher incidence of maternal risk factors but it was not statistically significant.

Table 1: Gender wise distribution.

Males	Females
20	20

Table 2: Distribution with respect to birth weight.

Birth weight	No. of patients	%
Less than 1 kg	3	7%
1-2 kg	26	65%
>2 kg	11	28%

Table 3: Distribution with respect to gestational age.

Age group	28-32	>32-34	>34-36
No of neonates	14 (35%)	13 (32%)	13(33%)

Table 4: Maternal risk factors.

Maternal risk factors	No. of patients (13/40)
Preeclampsia	7
Prolonged leaking per vagina (>12 hours)	2
Oligohydramnios	2
Gestational hypertension	1
Eclampsia	1

Table 5: Neonatal complications (26/40).

Neonatal complications	No of patients
Respiratory distress syndrome	12
Positive blood culture	8
Meningitis	4
Necrotizing enterocolitis	4
Neonatal jaundice	3
Perinatal asphyxia	3

Average weights (kg) at the time of discharge, after 1 week from discharge, after 15 days and then after 1 month from their discharge showing a gradual increase from average weight of 1.6 kg at birth to 2.2 kg at 1 month after discharge (Figure 1).

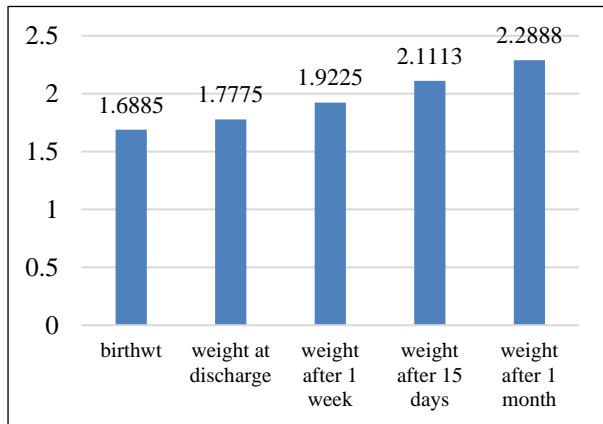


Figure 1: Average weight gain.

Table 8 shows that weight gain was significantly more in first week after discharge amongst neonates who had

birth weight less than 1.5 kg and the total weight gain was significantly more in neonates who weighed less than 1.5 kg at birth.

Table 6: Distribution with respect to adequate for gestational age and small for gestational age.

Adequate for gestational age (AGA)	Small for gestational age (SGA)
28	12

Table 7: Correlation parameters.

Correlation parameters	p value
Neonatal complications between AGA and SGA	p=0.8 (not significant)
Neonatal complications and lower gestational age	p<0.0001 (significant)
Lower gestational age and duration of NICU stay	p<0.01 (significant)
Maternal risk factors and lower gestational age	p=0.3 (not significant)

Table 8: Growth pattern with respect to categories of birth weight.

Variable	Group	No of patients	Mean	Sd	p for trend
Gestational age	<1.5 kg	18	31.333	2.4495	0.0001
	1.5-2 kg	9	33.667	1.8708	
	>2 kg	13	34.692	1.1094	
	Total	40	32.95	2.4594	
Wt. gain in 1 week	<1.5 kg	18	204.4	226	0.001
	1.5-2 kg	9	16.7	79	
	>2 kg	13	-21	40	
	Total	40	89	18.8	
Wt. gain in 1 st week - 15 days	<1.5 kg	18	166.7	144.4	0.442
	1.5-2 kg	9	100	100	
	>2 kg	13	146.2	114.5	
	Total	40	0.145	0.1259	
Wt. gain from 15 days to 1 month	<1.5 kg	18	158.3	73	0.177
	1.5-2 kg	9	172.2	44	
	>2 kg	13	207.7	83.8	
	Total	40	177.5	73	
Total wt. gain	<1.5 kg	18	707.2	274	0.037
	1.5-2 kg	9	488.9	188	
	>2 kg	13	529.2	182	
	Total	40	600.3	245	

DISCUSSION

Preterm VLBW infants are at an increased risk of postnatal growth failure due to hostile ex-utero environment and impaired postnatal nutrition.⁹ This poor

postnatal growth has significant bearing on long-term neuro-developmental outcome.¹⁰ Hence it is important to identify the neonatal complications and study their growth pattern in NICU and post NICU discharge.

Demographic profile

A total of 40 preterms were studied out of which 20 were males and 20 were females (Table 1). Birth weight ranged from 0.99 kg to 2.6 kg with average birth weight of $1.6 \text{ kg} \pm 0.466 \text{ kg}$ (Table 2). The number of preterms in 28-32wks. age group was 14; in the age group 32-34 wk was 13 and in the age group 34-36 wk was 13 (Table 3).

Maternal risk factors

The preterm delivery was associated with various maternal risk factors (Table 4).

These risk factors were prolonged leaking per vagina, eclampsia, gestational hypertension, oligohydramnios, and pre-eclampsia.^{1,2,7} In a study done by Peter et al, antepartum hemorrhage, prolonged rupture of membranes and preeclampsia were significantly associated with preterm delivery of which the most common morbidity was pre-eclampsia.¹¹ Maternal risk factors have a huge impact on the neonates in terms of their further growth and development and also associated with neonatal morbidity.

The complications of preterm birth arise from immature organ systems that are not yet prepared to support life in the extrauterine environment. In the present study the neonatal complications included respiratory distress syndrome, necrotizing enterocolitis, neonatal jaundice and perinatal asphyxia.^{3,4,12} The most common complication identified was respiratory distress syndrome (Table 5). In a study done by Tina et al, the most common neonatal complication identified was apnea followed by sepsis and perinatal asphyxia.¹² Necrotizing Enterocolitis (NEC) is an acute injury of the small or large intestines that causes inflammation and injury to the bowel lining and that primarily affects preterm infants. In studies done by Lee et al, and Smith et al, NEC occurred in 3 percent of infants born before 33 weeks of gestation and in 7 percent of infants with birth weights less than 1,500 grams.^{13,14}

Preterm infants have immature immune systems that are inefficient at fighting off the bacteria, viruses, and other organisms that can cause infections. The most serious manifestations of infections with these agents commonly seen in preterm infants include pneumonia, sepsis, meningitis, and urinary tract infections. According to Stoll et al, as many as 65 percent of infants with birth weights of less than 1,000 grams have at least one infection during their initial hospitalization.¹⁵ In the present study, culture positive sepsis was seen in 8 neonates. The most common organism identified was *Acinetobacter* (40%).

It is important to divide the neonates with respect to their weight and height at birth. Small for gestational age are neonates with birth weight less than the 10th percentile.¹⁶ In the present study total no. of AGA were 28 and total no of SGA were 12 (Table 6). These two

groups were further correlated with respect to the incidence of neonatal complications and duration of NICU stay. Though there was higher incidence of neonatal complication among the AGAs compared to SGA, there was no statistical difference between neonatal complication associated between these two groups. This can be explained on the basis of relatively less no of SGA neonates as compared to AGA group. However, in a study done by Tusseau et al, there was significant incidence of neonatal complications like hypoxia, apnea and sepsis in the SGA group.¹⁷ SGA preterms due to intrauterine or extrauterine factors have fewer nutrient sources which increases their risk of infections.

The neonates in the 3 age groups (28-32-week, 32-34-week, 34-36 week) were correlated with respect to neonatal complications and duration of NICU stay. An interesting finding noted was that there was significant difference in the incidence of neonatal complications and duration of hospitalization between these groups (Table 7). Thus 28-32-week age group is critical in view of complications and requirement of prolonged NICU stay. This prolongation of NICU stay is because of positive sepsis in many of these preterms. Tina et al, compared differences in the neonatal complications in VLBW and LBW preterms.¹² There was significant increase in the neonatal complications among the VLBW preterms.

Weight gain pattern

In the present study time to regain birth weight was 14 days for gestational age 28-32 week: 12 days for gestational age 32-34 and 10 days for 34-36 weeks at birth gestation. Mean age to regain birth weight was 10 for AGA and 12 for SGA. These findings were comparable to the study done by Georgie Matthew et al, where the mean age to regain birth weight ranged from 12.0 days for 33 weeks' gestation to 17.6 days for 28 weeks' gestation.¹⁸ Mean age (\pm SD) to regain birth weight was 10.0 (3.7) in AGA and 8.7 (3.5) days in SGA babies in a study by Saluja et al.¹⁹ Other studies like the Pre-MGS study and the NICHD study showed similar findings.^{20,21}

Follow up of the growth pattern

Growth of the new borns was observed till 1 month from their discharge. Weight of the new borns were measured at birth, at discharge, one week after discharge, 15 days after discharge and 30 days after discharge (Figure 1). In the present study it was seen that there was variable growth in weight among different groups of birth weight. It was observed that weight gain showed a wide variation (SD of 188 gm) in the first week after discharge. This may be because decrease in weight was seen in first week in 4 newborns with some of them losing as much as 150 gms. Gain in weight almost doubled in the second week after discharge, though one of the new borns lost weight of 50 gms and there was no weight gain in 5 of them. A steady weight gain pattern was observed from 15 days to

1 month with a minimum variation of 73 gms. In the present study also weight gain was significantly more in first week after discharge amongst neonates who had birth weight less than 1.5Kg (Table 8). Also, the total weight gain was significantly more in neonates who weighed less than 1.5 kg at birth. This can be because of proper counseling done of the parents of very low birth weight neonates and thus signifies its importance.

There have been some studies like the one done by Suman Das et al, which have shown long term follow up of 1 yr to assess the growth and neurodevelopmental parameters.²² In the study done by Dhawale et al, there was increased morbidity such as increased incidence of viral infections, diarrhea, convulsions and developmental delay in the neonates with birth weight <1.5 kg.²³ There was 12% increased incidence of failure to thrive amongst these neonates.

However, there are very few studies which have highlighted immediate weight change pattern of NICU graduates. A study done by Saluja et al, found out the weight gain pattern of preterms during first seven days of NICU stay.¹⁹ Hence it is important as immediate detection of causes of not adequate weight gain will help in prompt counseling of the parents and also initiate immediate treatment.

The limitation of this study is that being a retrospective study optimal feeding patterns for good weight gain could not be analysed.

CONCLUSION

Lower gestational age group 28-32 weeks was significantly associated with neonatal complications and prolonged duration of hospitalization. Immediate follow up of the preterms is necessary as there is wide variability in the growth patterns in various gestational age groups. Good Parental counselling regarding feeding and care of neonate post discharge improves weight gain. High Risk new-born periods should focus on growth patterns in early discharge period to prevent early malnutrition.

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

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