



Original Research Article

Prospective study to determine weight loss as predictor for neonatal hyperbilirubinemia in term neonates

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ABSTRACT

Background: Neonatal hyperbilirubinemia is a common clinical problem encountered during the neonatal period, especially in the first week of life. Significant hyperbilirubinemia is associated with a greater weight loss after 72 hours of life. Poor caloric intake seems to have a greater effect on the regulation of serum bilirubin.

Aim of the study: To determine if weight loss can be a predictor for neonatal hyperbilirubinemia in term neonates.

Material and Methods: This was a prospective study done in department of Paediatrics, MediCiti Institute of Medical Sciences, Medchal, Telangana for a duration of one year from March 2019 to February 2020.

Results: 63.6% (35/55) showed weight loss more than 7% and 36.6% showed weight loss less than 7%. Inadequate breast feeding was seen in 81.8% (45/55) cases and 18.1% showed adequate breast feeding.

Conclusion: In our study birth weight loss after 72 hours of birth can be a predictor factor for neonatal hyperbilirubinemia, and may also serve as a helpful clinical factor to prevent significant hyperbilirubinemia 72 hours after birth.

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1. Introduction

Neonatal hyperbilirubinemia is a common clinical problem encountered during the neonatal period, especially in the first week of life.¹

Nearly 8% to 11% of neonates develop hyperbilirubinemia. When the total serum bilirubin (TSB) rises above the 95th percentile for age (high-risk zone) during the first week of life, it will be considered as hyperbilirubinemia.^{2,3}

Hyperbilirubinemia in healthy term newborns during the first week of life is caused by elevation of unconjugated serum bilirubin.⁴ One of the risk factors for hyperbilirubinemia is excessive weight loss.^{5,6} Weight loss in the infant of greater than 7% from birth weight indicates

possible breastfeeding problems.⁷

Hyperbilirubinemia and feeding problems are two of the most common complaints in the first weeks of life.⁸ Hyperbilirubinemia and feeding difficulties with or without dehydration are the most frequent indications for readmission in the first two weeks of life^{9,10} and strongly related each other due to inadequate oral intake, particularly in term infants.^{11,12}

Exclusively breastfed healthy term infants in whom breastfeeding has not been well established by the time of discharge are at greater risk of poor caloric intake, dehydration associated with decreased volume and frequency, and the secondary delayed gastrointestinal motility determines an increase in the enterohepatic circulation of bilirubin.^{13,14}

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2. Aim of the study

To determine if weight loss can be a predictor for neonatal hyperbilirubinemia in term neonates

3. Objectives of the study

1. To assess weight of healthy term newborn at 0, 24, 48 and 72hrs. of life.
2. To assess serum bilirubin level in newborns who are clinically icteric according to Kramer staging and with body weight loss more than 7%.

4. Material and Methods

This was a prospective observational study done in the department of Paediatrics at MediCiti Institute of Medical Sciences, Medchal, Telangana, India, over a period of one year from March 2019 to February 2020.

The study did not have any ethical issues. Written informed consent was obtained from the parents /guardian of the neonates included in the study.

4.1. Study group

Comprises of all newborn healthy term and preterm babies with a birth body weight of more than 2500 gms

4.2. Inclusion criteria

1. Mother of babies willing to participate in the study
2. Gestational age more than 34 weeks
3. Birth body weight (BW) of more than 2500 gm
4. All term and preterm healthy newborns

4.3. Exclusion criteria

1. Mother of babies not willing to participate in the study
2. ABO and Rh incompatibility
3. Neonates of Diabetic mother
4. Hypothyroid babies
5. Babies born with congenital anomalies
6. Direct/conjugated bilirubinaemia
7. Birth trauma- Cephalohematoma, Subgaleal haemorrhage, etc

4.4. Method of collection of data

Prospective cross sectional observational study done on 55 neonatal cases attending Department of Pediatrics. The study protocol was explained to the mothers of the neonates.

Questionnaire was prepared for collection of Neonatal data: that included neonatal age, gender, gestational age, birth weight, weight on admission, 5 minute Apgar score, reason for hospitalization, signs and symptoms of hyperbilirubinemia and history of complaints on admission, Blood group / Direct Coombs test DCT (in relevant cases) frequency of breast feeding and time of initiation of breast

feeding, the time of passing meconium and duration of hospitalization.

Birth body weight and weights at 24, 48 and 72 hours of life were assessed.

Total serum bilirubin was assessed in newborns who were clinically icteric according to Kramer Staging and with body weight loss more than 7%.

Total bilirubin more than 15 mg/dL at 72 hours after birth was taken as cut-off value for intervention according to hour specific Bhutani nomogram risk chart.

Correlation between body weight loss percentage and serum bilirubin was done in all the cases.

A questionnaire was also prepared for collection of maternal data (Antenatal history): that included Antenatal registration, maternal age, parity (Primigravida, 2nd/3rd, Multigravida), history of maternal illness in pregnancy/ high risk factors namely Pregnancy induced hypertension, bad obstetric history, premature rupture of membranes > 18 hours, medical disease in pregnancy (Heart disease, Diabetes mellitus), Others (Anemia, chronic respiratory diseases), and HIV / HBsAg status of mother.

Type of delivery: Full term normal delivery, Instrumentation: forceps/vacuum, Lower segment cesarean section (LSCS).

Blood group with Rh factor, history of jaundice in previous sibling and duration of postpartum hospitalization.

The new Ballard score was designed to assess a newborn's gestational age through a scoring system that combines physical characteristics with neuromuscular development.⁵

Weight of the neonates was recorded as: Birth weight on the first day (24 hours) after birth (day 1), Birth weight on the second day (48 hours) after birth (day 2), and birth weight on the third day (72 hours) after birth (day 3).

Data was entered into excel sheets and percentages and ratios were calculated.

4.5. Laboratory investigations

Blood samples were collected from neonates and serum bilirubin estimation, blood urea, serum creatinine testing was done.

The infants were divided into two groups: the significant hyperbilirubinemia group (total bilirubin level greater than 15 mg/dL 72 hours after birth) and the non significant hyperbilirubinemia group (total bilirubin level \leq 15 mg/dL 72 hours after birth).

The infants in the significant hyperbilirubinemia group were admitted for phototherapy. The correlations between birth weight loss (BWL) percentage within the first 3 days and the total bilirubin level 72 hours after birth were analyzed separately.

Complete blood count (CBC): 2 ml of blood sample was collected in K3 EDTA vials from all the cases included in the study.

Peripheral smear was stained by Leishman stain and examined in detail.

Reticulocyte count was estimated on New Methylene Blue stained smears and hemolysis was looked for. Direct and indirect Coombs test was done by agglutination methods. Maternal and neonatal blood group and Rh typing was noted.

5. Observations and Results

The study had a total of 55 neonatal cases.

Table 1: Gestational age

| Gestational age | No. of cases | Percentage (%) |
|-----------------|--------------|----------------|
| Term | 35 | 63.6% |
| Preterm | 20 | 36.3% |
| Total | 55 | 100% |

In the present study, term neonates were more than preterm neonates.

Table 2: Gender distribution

| Gender | No. of cases | Percentage (%) |
|---------|--------------|----------------|
| Males | 32 | 58.1% |
| Females | 23 | 41.8% |
| Total | 55 | 100% |

In the present study, male babies were slightly more than female babies.

Table 3: Mode of delivery

| Mode of delivery | No. of cases | Percentage (%) |
|-------------------------|--------------|----------------|
| Normal vaginal delivery | 35 | 63.6% |
| Instrumental | 05 | 9.0% |
| Cesarean delivery | 15 | 27.2% |
| Total | 55 | 100% |

Most of the neonates (63.6%) were delivered by normal vaginal delivery.

Table 4: Birth weight distribution

| Weight distribution | 1 st day | 2 nd day | 3 rd day |
|---------------------|---------------------|---------------------|---------------------|
| <2500 | 10(18.1%) | 40(72.7%) | 45(81.8%) |
| 2500-3500 | 30(54.5%) | 10(18.1%) | 05(9.09%) |
| >3500 | 15(27.2%) | 05(9.09%) | 05(9.09%) |
| Total | 55(100%) | 55(100%) | 55(100%) |

In the present study weight was noted on 1st day, 2nd day and 3rd day respectively.

On 1st day there was majority of the neonates ie, 30 (54.5%) were having weight between 2.5 kg to 3.5 kg.

On second day 40 (72.7%) were showing loss of weight ie, less than 2.5 kg.

On 3rd day 81% (45/55) of neonates showed weight of less than 2.5 kg

Table 5: Weight loss based on 7% cut-off

| Weight loss | No. of cases | Percentage (%) |
|-------------|--------------|----------------|
| <7% | 20 | 36.6% |
| >7% | 35 | 63.6% |
| Total | 55 | 100% |

In the present study, 63.6% (35/55) showed weight loss more than 7% and 36.6% showed weight loss less than 7%.

Table 6: Adequacy of breast feeding

| Breast feeding | No. of cases | Percentage (%) |
|----------------|--------------|----------------|
| Inadequate | 45 | 81.8% |
| Adequate | 10 | 18.1% |
| Total | 55 | 100% |

In the present study, most of the cases (81.8%) showed inadequate breast feeding.

Table 7: Serum bilirubin levels

| Bilirubin levels | 1 st day | 2 nd day | 3 rd day |
|------------------|---------------------|---------------------|---------------------|
| <12 mg/dl | 40 | 30 | 20(36.3%) |
| >12 mg/dl | 15 | 25 | 35(63.6%) |
| Total | 55 | 55 | 55(100%) |

In the present study, significant hyperbilirubinemia >12mg/dl (63.6%) (35/55) was noted 72 hours after birth.

Table 8: Parity

| Gravida | No. of cases | Percentage (%) |
|--------------|--------------|----------------|
| Primigravida | 30 | 54.5% |
| Multigravida | 25 | 45.4% |
| total | 55 | 100% |

According to parity distribution more number of mothers (54.5%) were primigravida and it shows that neonates who were first child had pathologic weight loss.

6. Discussion

6.1. Comparative study based on gender

In the present study 58.1% (32/55) were males and 41.8% (23/55) were females. Salas et al¹⁵ in their study had 79 infants of which 64.6% were males.

6.2. Significant hyperbilirubinemia and birth weight loss

Significant hyperbilirubinemia and loss of birth weight are related. In the present study, 63.6% neonates presented with significant hyperbilirubinemia 72 hours after birth. In the study by Yang et al¹⁶ a total of 115 (33.5%) neonates

presented with significant hyperbilirubinemia 72 hours after birth. Chang et al¹⁷ in a similar noted weight loss of about 8% after 48 hours and weight loss of 11% after 72 hours of birth.

6.3. Comparative studies based on breast feeding

The practice of breast feeding also affects the weight of neonates. In the present study, 81.8% (45/55) showed inadequate breast feeding and 18.1% showed adequate breast feeding. Yang et al¹⁶ found in their study that breastfeeding did not statistically correlate with significant hyperbilirubinemia. Salas et al¹⁵ in their study observed that the hyperbilirubinemia readmission rate was 5% among breastfed infants.

6.4. Comparative studies based on Gestational age

The gestational age is known to have a direct relation with the birth weight. In the present study 63.6% (35/55) neonates with term gestation showed greater weight loss and were associated with hyperbilirubinemia, whereas, in the study by Chang et al¹⁷ neonates with lower gestational age and greater weight loss percentage were associated with hyperbilirubinemia.

6.5. Comparative studies based on bilirubin levels

In the present study 63.6% (35/55) showed weight loss more than 7% and significant hyperbilirubinemia of >12mg/dl after 72 hours of birth. Salas et al¹⁶ observed that 38% of their cases had significant weight loss. The frequency of severe hyperbilirubinemia (> 20 mg/dL) was notably higher among infants with significant weight loss. Boskabadi et al¹⁸ noted average weight loss in the neonates with severe hyperbilirubinemia (>20 mg/dl) as three times that of moderate hyperbilirubinemia (< 20 mg/dl). Huang et al¹⁹ observed that bilirubin level more than 15mg/dL during days 4 to 10 of life was defined as significant hyperbilirubinemia and that 23.6% of their cases developed significant hyperbilirubinemia.

7. Conclusion

Weight loss of more than 7% after 72 hours of birth may be a predictor factor for neonatal hyperbilirubinemia, and may also serve as a helpful clinical factor to prevent significant hyperbilirubinemia 72 hours after birth.

8. Source of Funding

No financial support was received for the work within this manuscript.

9. Conflict of Interest

The authors declare they have no conflict of interest.

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