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Research Article

Breastfeeding jaundice: how big is the problem?

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ABSTRACT

Background: Breastfeeding jaundice is jaundice requiring phototherapy where dehydration (weight loss more than 10% of the birth weight) was the only cause. Weight loss more than 10% is seen in 7% of term neonates. Objective of the study is to determine the prevalence and impact of inadequate breastfeeding on jaundice among neonates (>35 weeks) requiring phototherapy.
Methods: The data for this study was taken from an observational study carried out in the neonatal unit of a tertiary care hospital for determining the incidence of jaundice without a known etiology. 200 eligible neonates were analyzed along the lines of peak bilirubin, onset of clinically significant jaundice and duration of phototherapy. Data was analyzed for the prevalence and impact of inadequate breastfeeding (leading to >10% weight loss) on jaundice.
Results: Eighty seven (43.5%) subjects had no cause for jaundice and were classified as "physiological jaundice". The remaining 113 babies were classified as "non-physiological jaundice". 39 (19.5%) of the 113 babies had only dehydration as the cause and was called breastfeeding jaundice. 21 (10.5%) of the remaining 74 babies had dehydration contributing to the cause of non-physiological jaundice. Thus 50% of babies with non-physiological jaundice had dehydration contributing to the jaundice. The "breastfeeding jaundice" group had a lower peak bilirubin (p=0.02) and a later onset of jaundice requiring phototherapy (p=0.04) as compared to the rest of the pathological group.
Conclusions: Inadequate breast feeding contributes to 50% of non-physiological jaundice. Aggressive lactation support, with daily weight monitoring can reduce the requirement of phototherapy by 30%.

Keywords: Non physiological jaundice, Phototherapy, Dehydration, Breastfeeding jaundice

INTRODUCTION

60% of term and 80% of preterm neonates develop neonatal jaundice in the 1st week of life.[1] Under normal circumstances, jaundice in a newborn becomes visible on the 2nd-3rd day and reaches a peak of 205.25 µmol/L (12 mg/dl) between day 4 to day 5 of life. It then subsides over a period of 4-5 days and is termed "physiological". Jaundice is considered "pathologic" if the time of appearance, duration, or pattern varies significantly from that of physiological jaundice.[1] Conventionally jaundice in a term neonate with bilirubin ≥256.56 µmol/L (15 mg/dl) is pathological (non-physiological) and any jaundice that requires phototherapy has been defined as "non-physiological".[2] Breastfeeding jaundice is due to inadequate intake of breast milk by the neonate, either due to inadequate dietary intake by the mother or due to improper breastfeeding techniques. Subjective indicators of adequate breastfeeding are 4 to 6 thoroughly wet diapers in 24 hours, 3 to 4 times passage of stool by 4th day and change in stools from meconium to mustard yellow mushy stools by 4th day.[3] A body weight loss of more than 7-10% by day 3 is taken as an objective measure of inadequate breastfeeding.[4] Breastfeeding jaundice, a preventable form of non-physiological jaundice, develops in 13% of exclusively breastfed infants during the 1st week of life.[1] There is no data available on the contribution of dehydration to jaundice requiring phototherapy.

We therefore undertook this study to determine the prevalence of "breastfeeding jaundice" among late preterm and term neonates requiring phototherapy. We also analyzed the impact of inadequate breastfeeding, on the onset and peak bilirubin and duration of phototherapy in babies with non-physiological jaundice.

METHODS

The data for this study was taken from an observational study carried out in a level III neonatal unit and postnatal wards of a tertiary care hospital over one year. It was done for determining the incidence of neonatal jaundice without a known etiology, requiring phototherapy.

Inclusion criteria

Neonates >35 weeks requiring phototherapy as per Bhutani's chart and in whom all mandatory investigations were done were included in the study.

Exclusion criteria

Babies in whom phototherapy was started empirically or in whom all mandatory investigations were not done were excluded from the study.

Case selection

861 neonates born after 35 completed weeks of gestation were evaluated for neonatal jaundice as per the neonatal unit protocol. 40 of these babies who received phototherapy empirically were excluded. 104 babies were excluded for lack of mandatory investigations due to various reasons. 200 eligible neonates with unconjugated jaundice requiring phototherapy, satisfying the above inclusion and exclusion criteria, were analysed.

Neonatal unit protocol for management of neonatal jaundice

All neonates were monitored in natural light twice a day for appearance of jaundice clinically. Clinical assessment was based on Kramer's rule of cephalocaudal progression of jaundice. A blood sample for total and conjugated bilirubin (TB/CB) was obtained if jaundice was evident at less than 36 hours of age, or if the baby was icteric till the abdomen or if the baby was being discharged prior to 72 hours. Doumas reference method (modified Jendrassik and Grof procedure) was used for estimation of total and conjugated bilirubin (TB/CB). Phototherapy was started for any baby with jaundice as per AAP guidelines (Bhutani's chart) for infants >35 weeks or if bilirubin >256.56 µmol/L (15 mg/dl). Gestational age was determined based on last menstrual period and New Ballard score.

A detailed history with respect to the onset of the jaundice, risk factors present, feeding history, starting of phototherapy, number of days phototherapy given, type of light used, were taken. All neonates were examined for bruises, cephalhaematoma, scalp injuries, liver, and spleen enlargement. Following mandatory investigations were done in all babies requiring phototherapy: hematocrit, peripheral smear, reticulocyte count, total and conjugated bilirubin, TSH level, blood group of mother and baby, and direct coomb's test whenever applicable and G-6-PD levels were done whenever possible. The peak level of hyperbilirubinemia was noted. Serial estimation of bilirubin done as per unit protocol, that is

- Term non hemolytic-once in 24 hrs
- Preterm once in 12 hrs
- Hemolytic jaundice once in 6 to 8 hrs

Phototherapy was discontinued when bilirubin was <222.35 µmol/L (13 mg/dl) in term and <171.04 µmol/L (10 mg/dl) in preterm infants.

All mothers of neonates admitted to the neonatal unit were given lactation counselling as per unit protocol. Additional support was given to mothers who were perceived to have a feeding problem. Babies with weight loss >10% of their birth weight or requiring lactation support for >25% of the feeds were classified as having feeding problems.

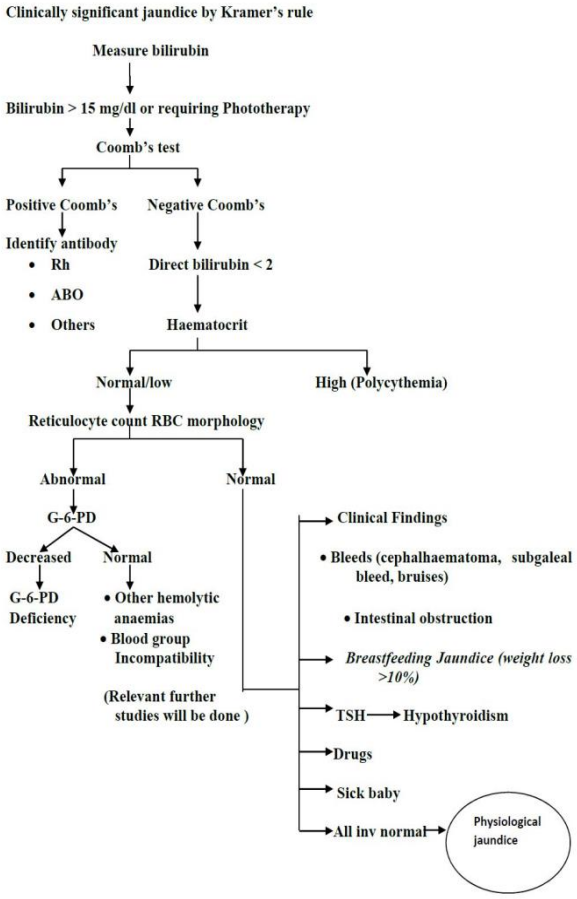

Figure 1: Determination of etiology of jaundice.

Methodology

Determination of etiology of jaundice was done as per Figure 1. Babies who were not found to have an etiology for the jaundice were classified as "physiological" for the purpose of the study. "Breastfeeding jaundice" was defined as neonatal jaundice in a baby who has lost more than 10% of birth weight or required lactational support for more than 25% of the feeds; that is only had dehydration as the sole cause for jaundice. 200 eligible neonates were analyzed along the lines of peak bilirubin, onset of clinically significant jaundice and duration of phototherapy. Data was also analyzed for the prevalence and impact of inadequate breastfeeding on jaundice.

Statistical analysis

Descriptive and inferential statistical analysis has been carried out in the present study.[5] The data obtained was entered in Microsoft Excel spread sheet. Data was analyzed using SPSS (Statistical Package for Social Sciences) version 16 for Windows. Continuous variables were reported by mean and standard deviation. Categorical variables were reported by numbers and percentages. Independent 't' test and Chi square test/ Fischer exact test was used to test the statistical significance. Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients. P<0.05 was considered as statistically significant.

RESULTS

The baseline characteristics of the 200 eligible babies included in the study is shown in Table 1. An etiology for neonatal jaundice was found in 113 babies and hence labeled as non-physiological jaundice. Of these 39 babies had dehydration as the only cause for jaundice and hence classified as dehydration or breastfeeding jaundice. Of the remaining 74 babies, 21 had dehydration also contributing to the cause for jaundice along with other causative factors (Figure 2). Thus overall 60 of the 200 (30%) babies had dehydration as a cause for jaundice requiring phototherapy. 87 of the 200 babies had no identifiable etiology for the jaundice and was labeled as physiological jaundice (Figure 2). All infants tested for hypothyroidism (153) and G6PD deficiency were negative. Table 2 compares physiological, non-physiological and breastfeeding jaundice with respect to peak bilirubin levels, onset of jaundice and response to phototherapy. Breastfeeding or dehydration jaundice has a later onset of clinically significant jaundice (p=0.04) with lower peak bilirubin levels (p=0.02) and requirement of shorter duration of phototherapy in comparison to other non-physiological cause. 21 of the 74 babies having pathological jaundice (NPJ) with dehydration, had an earlier onset of jaundice (p=0.08) with longer requirement of phototherapy (p=0.58).

Table 3 shows prevalence of breastfeeding jaundice in different groups and their p value. Order of birth, maternal age and maternal illness, presence of risk factors, place and mode of delivery did not statistically increase the chances of dehydration in exclusively breastfed neonates in this study. Late preterm babies (p=0.005) and male babies (p=0.02) had a significantly higher risk of dehydration contributing to jaundice requiring phototherapy. Most babies in the study had been exclusively breast fed. Only those babies for whom feeding were not going well or had dehydration were given lactation support and considered for formula feeds. Feeding issues was identified in only 12.7% of the 181 exclusively breastfed babies (p = 0.03). Sibling history of neonatal jaundice did not contribute to prevalence of breastfeeding jaundice (4.7%).

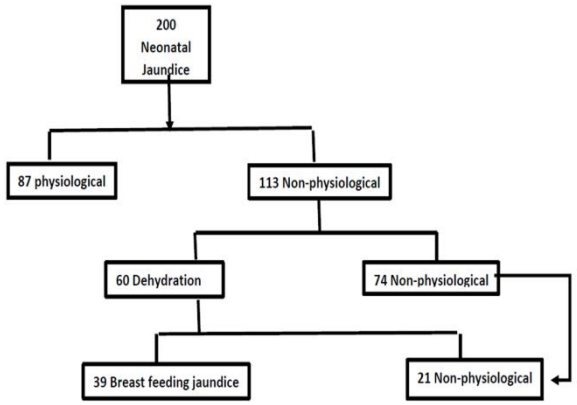

Figure 2: Etiology of unconjugated jaundice.

Table 1: Characteristics of neonates in the study.

Baseline variables	Number of new borns	Percentage
Gestational age		
Preterm	44	22.0
Full term	156	78.0
Mode of delivery		
Normal	125	62.5
LSCS*	75	37.5
Age of onset Jaundice		
1-2 days	52	26
3-4 days	134	67
5-6 days	11	5.5
7-8 days	3	1.5
Gender		
Male	108	54.0
Female	92	46.0
Total	200	100.0

*LSCS: Lower segment caesarean section

Table 2: Comparison between physiological, non-physiological and jaundice due to dehydration (breastfeeding jaundice).

Diagnosis	n=200	Peak bilirubin	Mean onset of significant jaundice in hours, mean(SD)	Duration of phototherapy in hours, mean(SD)
Physiological jaundice	87	295.73 (57.64) (17.29 (3.37))	66.68 (28.40)	64.81 (28.88)
Non physiological jaundice	113	333.70 (117.68) (19.51(6.88))	59.21 (19.58)	68.26 (30.48)
Only due to dehydration	39	311.29 (79.36) (18.20 (4.64))	72.10 (19.21)	65.03 (26.72)
Non-physiological jaundice due to other causes	74	333.70 (117.68) (19.51(6.88))	59.21(19.58)	68.26 (30.48)
Dehydration contributing to other causes of NPJ*	21	318.31 (104.51) (18.61(6.11))	68.16 (19.55)	72.48 (26.27)

*NPJ-Non physiologic jaundice. Peak bilirubin, mean (SD), in µmol/L (mg/dl)

Table 3: Prevalence of breastfeeding jaundice in different groups.

Characteristic		Number/percentage	P value
Parity	Primipara	42/33.6%	0.2021
	Multipara	18/24%	
Mode of delivery	Normal delivery	36/28.6%	0.6323
	LSCS	24/32.4%	
Gender	Male	40/37%	0.0207
	Female	20/21.7%	
Risk factors	Risk factors+	55/32%	0.1817
	No risk factors	5/17.8%	
Gestational age in weeks	35-36	21/47.72%	0.0051
	37-40	38/25.33%	
	>40	1/16.66%	
Neonate	Inborn	44/30%	0.7361
	Out born	16/28%	
Maternal illness	Yes	25/28.40%	0.7562
	No	35/31.25%	
Maternal age	<21	7/25%	0.0889
	21-30	46/30.66%	
	31-40	5/25%	
	>40	2/100%	

*PJ-Physiologic jaundice, NPJ-Non physiologic jaundice

DISCUSSION

Jaundice is a common and in most cases benign problem in neonates. It could progress to significant hyperbilirubinemia requiring treatment. Despite its potential toxicity (kernicterus), bilirubin is an important antioxidant.[6,7] Hence it is crucial to identify those neonates who would require aggressive phototherapy from those who require significant lactational support or both.[8]

In this study we found that 43.5% of the total babies recruited who conventionally would be classified as "non physiologic or pathological jaundice" had no obvious cause for the jaundice. The peak bilirubin for "physiological jaundice" group was 295.73 µmol/L (17.29 mg/dl). The peak mean bilirubin for late preterms was 268.36 (42.59) µmol/L (15.69(2.49) mg/dl) which is as per the conventional definition; but the peak mean bilirubin for the term babies was 301.37 (59.01) µmol/L (17.62(3.45) mg/dl). This is significantly higher than the most liberal accepted cut off for physiological jaundice (p =0.03).[9-11] Similar results have been found in the study conducted by Bhutta ZA and Arif K on a birth cohort in Karachi in 1999[12] and Maisel's.[13] Also the "physiological" group had a lower peak bilirubin level (p=0.009) and a later onset of jaundice requiring

phototherapy (p=0.012) as compared to the non-physiological group.

Thirty nine (19.5%) of babies were found to have only dehydration as the cause for the jaundice. These babies may be classified as breast feeding jaundice, with the cause being an inadequate intake of breast milk. The overall prevalence of dehydration in non-physiological jaundice was 60 out of 113 (50%) babies. It indicates a need for more aggressive antenatal and postnatal counseling of mothers and their families, regarding correct and appropriate techniques, for establishment and continuation of breast feeding. It also stresses the need for adequate dietary and water intake of the mother.[14,15] The breastfeeding jaundice group had a later onset of clinically significant jaundice with lower peak bilirubin levels (p=0.02) and requirement of shorter duration of phototherapy (p=0.04) in comparison to other non-physiological causes.

In cases with dehydration also as a cause for non-physiological jaundice, onset of jaundice was earlier, the peak bilirubin was higher, and duration of phototherapy longer. Thus exclusive breastfeeding leading to dehydration is a major deciding factor of duration of jaundice and phototherapy in patients with non-physiological jaundice.[16,17] Similar results were obtained in a study done by Chen et al.[18]

Breastfeeding offers many benefits like better neurodevelopmental outcome, decreased infection rates, obesity and asthma.[19] Since 1960, exclusive breastfeeding is a known risk factor for jaundice requiring phototherapy. A weight loss of more than 7% is associated with significant jaundice.[20] The success of breastfeeding is measured by the exclusivity and duration of the feeds.[21] The maternal and infant risk factors for lactation failure can be social and physiological.[22,23]

In this study prim parity, mode of delivery, presence of risk factors, sibling or family history of jaundice did not seem to have a statistically significant contribution to breastfeeding jaundice. This is in contrast to previous studies where the above mentioned factors contributed to inadequate breastfeeding.[18,22] However male babies were found to have a statistically significant risk for developing breastfeeding jaundice (p = 0.02) which could not be explained. Also late preterm babies (35-36 weeks) had a statistically significant risk of dehydration contributing to jaundice requiring phototherapy (p = 0.005).[24] Similar results were found in the study conducted by Agarwal et al.[25]

This study was done in a baby friendly hospital following the baby friendly hospital initiative introduced by WHO for successful exclusive breastfeeding. Weight loss of more than 10% is seen in 7% of term neonates in India.[26] Daily weight check of all in-hospital neonates may have ensured early detection and adequacy of feeding.[27] Successful breastfeeding would have led to adequate weight gain in the babies with dehydration in this study. It would have reduced the requirement and duration of phototherapy[28] by 30%. This would save human and material resources and reduce infant morbidity. Also prolonged phototherapy can lead to early cessation of breastfeeding or introduction of formula feeds.[29]

Since this was a retrospective analysis done on an observational study; apart from prematurity, the actual cause for inadequate feeding could not be determined. A multicentric study involving larger number of babies is needed to know the actual prevalence and the cause for breastfeeding or dehydration jaundice. In this study 43.5% of babies requiring phototherapy had no obvious cause for jaundice (labeled as physiological) suggesting a probable genetic cause for the jaundice. Therefore the babies labeled as breastfeeding or dehydration jaundice may also have had a genetic factor contributing to the jaundice.[30,31]

CONCLUSION

Breastfeeding jaundice or jaundice secondary to inadequate oral intake and improper feeding techniques, leading to weight loss is the commonest known cause of non-physiological jaundice. This suggests the need for aggressive lactation support in the management of jaundice, especially for late preterm (35-36 weeks). Ensuring proper and adequate breastfeeding, with daily weight check can reduce the requirement of phototherapy in late preterm and term babies by 20% and reduce the severity of pathological jaundice requiring phototherapy by 30%.

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