International Journal of Contemporary Pediatrics
Tank P et al. Int J Contemp Pediatr. 2018 Jan;5(1):106-109
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20175568

Original Research Article

Effect of intravenous fluid supplementation on drop in serum bilirubin levels in term babies with severe hyperbilirubinemia

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Received: 16 September 2017
Accepted: 27 October 2017

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ABSTRACT

Background: Varied results emerging out of various studies have created a controversy about effect of intravenous fluid supplementation on drop in Serum Bilirubin levels in term babies with severe hyperbilirubinemia. Paucity of literature also warrants this study. The objective of this study is to evaluate the probable effect, if any, of intravenous fluid supplementation in decreasing the serum bilirubin level in healthy term babies with hyperbilirubinemia from Northern India.
Methods: In this prospective study healthy term neonates (37-41 weeks gestation) with serum bilirubin (>18 mg/dl and <25 mg/dl) for treatment with phototherapy were randomly allocated to two groups, study group received intravenous fluid for total 16 hours along with breast feed and control group given only breast feeds.
Results: Baseline variables like sex distribution, age at admission, gestation, birth weight, admission weight, number of babies, appropriate for gestational age, mode of delivery, oxytocin use, incidence of breast feeding and serum bilirubin level at the time of inclusion in study, were comparable in both control and study group. Drop of total serum Bilirubin (TSB) at 4 hours, 8 hours, 24 hours, 36 hours and 48 hours of study were also significantly higher in study group as compared to control group. Although the drop in TSB level at 60 hours between two groups was not significantly different.
Conclusions: Based on our findings it can be concluded that additional intravenous fluid supplementation significantly reduced the serum bilirubin in study group as compared to control group.

Keywords: Fluid supplementation, Hyperbilirubinemia, Total serum bilirubin

INTRODUCTION

Jaundice or Hyperbilirubinemia is commonly encountered in our setup. Bilirubin is potential toxic to central nervous system and can cause serious permanent side effect called kernicterus, in which brain stem nuclei and basal ganglia are damaged, resulting in cerebral palsy.[1] Phototherapy is a safe way which has remained the standard treatment in neonatal hyperbilirubinemia. During phototherapy, bilirubin is converted to less toxic water-soluble photoisomers.[2,3] Because the photoproducts responsible for the decline in serum bilirubin are excreted in both urine and bile, maintaining adequate hydration and good urine output should help improving the efficacy of phototherapy. Phototherapy also increases the amount of body water loss, via insensible trans epidermal and stool water loss.[4,5]

Various studies have been done in past to see the effect of oral water, dextrose or artificial feed supplementation in

term neonates and have shown equivocal result.[6] The effectiveness of oral rehydration may not be reliable and fast enough in setting of critical hyperbilirubinemia when one would not be able to wait for a long time without exchange transfusion. Varied results emerging out of various studies have created a controversy about effect of intravenous fluid supplementation on drop in serum bilirubin levels in term babies with severe hyperbilirubinemia. Paucity of literature also warrants this study. Hence this study was planned to evaluate the probable effect, if any, of intravenous fluid supplementation in decreasing the Total Serum Bilirubin (TSB) level in healthy term babies with hyperbilirubinemia from Northern India.

METHODS

This cross-sectional study was performed at the Neonatal ICU at Government Multi Specialty Hospital, Sector-16, Chandigarh for a period of 10 months in year 2013. Term neonates with severe hyperbilirubinemia seeking care at Neonatal ICU at Government Multi Specialty Hospital, Sector-16, Chandigarh during the study period formed the study population. An inclusion criterion was term neonates (37-417/8 weeks gestation) presenting with severe hyperbilirubinemia (TSB >18 mg/dl and <25 mg/dl). The babies with obvious clinical signs of dehydration at enrollment were not included in the study.

Purposive sampling technique was adopted. This study included 60 term newborns having no other problem such as congenital abnormalities, sepsis, dehydration symptoms and were placed into 2 groups viz. case group (n=30) and control group (n=30) using simple random sampling. The first serum bilirubin level was taken upon admission. Other blood tests including mother and neonate blood group and Rh factor, complete blood count, reticulocyte count, Coomb's test, G6PD, and peripheral blood smear were also simultaneously taken. At bed side clinician assessed the hydration status of newborn independently. Clinical parameters heart rate, respiratory rate, capillary filling time, anterior fontanella, skin turgor, oral mucosa and eye ball status were recorded.

Study group patients received calculated intravenous fluid N/5 saline with 5% dextrose for 16 hours along with breast-feeding. Control group was not provided any extra fluid. They were continued to receive breast feed as they were receiving earlier prior to randomization procedure. Both the groups received CFL double surface blue light phototherapy. Infants were fully exposed to double surface phototherapy except eyes and genitalia. Phototherapy was discontinued when 2 serum bilirubin values 12 hours apart were <14 mg/dl. Outcome indicators of this study were drop in serum bilirubin level at 4, 8, 12 and 24 hours of study.

Following formula was used to calculate drop of TSB:

Drop of TSB (mg/dl) = TSB at specific time - TSB at inclusion.

Informed consent was obtained from parents. Permission of Institutional ethics committee (IEC) was sought before the commencement of the study. Data analysis was done using Statistical Package for Social Sciences (SPSS), version 20. The results were expressed using appropriate statistical methods. A two-tailed p <0.05 was considered statistically significant.

RESULTS

Data of 60 subjects was included in the final analysis. Baseline variables like sex distribution, age at admission, gestation, birth weight, admission weight, number of babies, appropriate for gestational age, mode of delivery, oxytocin use, incidence of breast feeding and serum bilirubin level at the time of inclusion in study, were comparable in both control and study group (Table 1).

Table 1: Baseline variables between study and control groups.

Baseline variables		Study group (n=30)	Control group (n=30)	P value**
Age at admission (hours)*		109.82±44.84	107.83±36.76	> 0.05
Gestation (weeks)*		37.9±0.75	37.08±0.82	
Birth weight (gm)*		2910.36±434.25	2795.27±414.83	
Admission weight (gm)*		2750.64±388.45	2658.19±411.02	
AGA No. (%)		27 (90%)	25 (83.33%)	
NVD No. (%)		19 (63.33%)	16 (53.33%)	
Oxytocin Use No. (%)		14 (46.67%)	13 (43.33%)	
Exclusive breast-feeding No. (%)		28 (93.33%)	25 (83.33%)	
TSB	Value (mg/dl)*	20.183±1.64	19.258±1.70	
	Range	18-24.8	18-24.3	

Mean±sd*; non-significant**; AGA- appropriate for gestational age; TSB- total serum bilirubin.

Drop of Total Serum Bilirubin (TSB) at 4 hours, 8 hours, 24 hours, 36 hours and 48 hours of study were also significantly higher in study group as compared to control group. Although the drop in TSB level at 60 hrs between two groups was not significantly different (Table 2, Figure 1).

Table 2: Drop of total serum bilirubin between study and control groups.

Hours of study	Study group (Mean±SD) mg/dl	Control group (Mean±SD) mg/dl	P value
4 hours	2.71±1.28	1.25±1.23	<0.001
8 hours	4.48±1.55	2.10±1.18	<0.001
12 hours	6.05±1.90	2.77±1.30	<0.001
24 hours	7.72±2.16	3.94±1.60	<0.001
36 hours	8.05±1.63	4.12±1.63	<0.001
48 hours	8.79±2.18	5.95±1.59	<0.001
60 hours	9.09±5.11	6.78±1.57	0.084

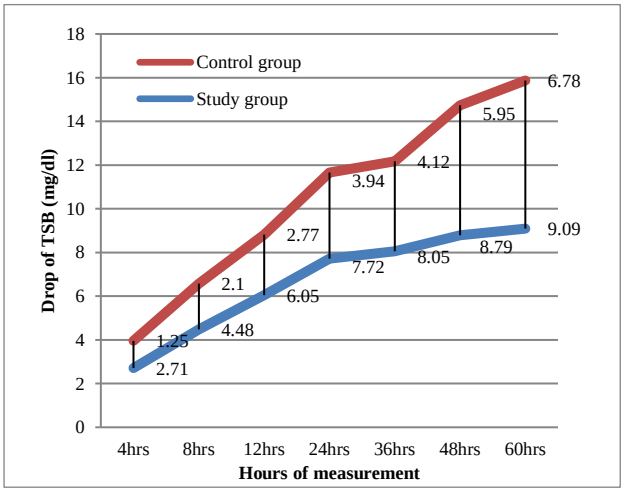

Figure 1: Graphical representation of drop of TSB between study and control groups.

DISCUSSION

In order to address the controversy about effect of intravenous fluid supplementation on drop in serum bilirubin levels in term babies with severe hyperbilirubinemia we evaluated the probable effect, if any, of intravenous fluid supplementation in decreasing the serum bilirubin level in healthy term babies with hyperbilirubinemia from Northern India. Sixty healthy term neonates (37-41 weeks gestation) with serum bilirubin (>18 mg/dl and <25 mg/dl) for treatment with phototherapy were allocated to two groups, study group received intravenous fluid for total 16 hours along with breast feed and control group given only breast feeds.

In the present study TSB levels were monitored at regular intervals at 4 hours, 8 hours, 12 hours, 24 hours, 36 hours and 48 hours. Drop of TSB and rate of drop of TSB were calculated at regular intervals in both groups. The drop of TSB and rate of drop of TSB were significantly more in study group as compared to control group. TSB levels were monitored till baby received phototherapy.

In a controlled study on the effect of water supplementation in normal term breast-fed babies who have physiologic jaundice, water supplementation was given to 120 babies, while 55 babies received no extra fluid.[6] There was no significant difference between the two groups when peak serum bilirubin levels and incidence of photo- therapy were compared.

Table 3: Studies on effect of intravenous fluid supplementation on drop in serum bilirubin levels.

Studies	Year	Outcome	Results
Present study	2013	Rate of drop of TSB	Significant
Demisroy et al[12]	2011	Drop of TSB	Not significant
Saiedi et al[14]	2009	Drop of serum bilirubin	Significant
Mehta et al[15]	2005	Drop in TSB	Significant
Iranpour et al[11]	2004	Rate of decrease of TSB	Not significant
Boo NY et al[9]	2002	Rate of decrease of TSB	Not significant
K L Tan et al[3]	1998	Rate of decrease of TSB	Significant
Decarvalho et al[13]	1980	Decrease of TSB	Not significant

Another randomized controlled trial has shown the beneficial effect of additional fluid in reducing serum concentration of bilirubin, but the finding was not statistically significant.[9] Authors compared the rates of decrease in serum bilirubin levels in well hydrated healthy and severely jaundiced term neonates during intensive phototherapy when given 10% extra oral, versus intravenous fluid supplementation. Although the mean rates of decrease in TSB were not significantly different between the extra oral and extra intravenous fluid supplementation groups but the rate of decrease in TSB were greater than that recommended by the AAP.[10] The AAP proposed that an effective intensive phototherapy should reduce the serum bilirubin levels by 1-2 mg/dl within 4 hour of treatment (or at a rate of 0.25-0.48 mg/h), while in the study, the rate of decrease in serum bilirubin during the first 4 hour after admission was between 0.6 and 0.65 mg/h in oral and intravenous fluid supplemented groups, respectively. They concluded that these rates of decrease in TSB could be due to fluid supplementation.

A study from Iran assigned 60 healthy breast-fed neonates with non-hemolytic hyperbilirubinemia randomly to receive either breast milk exclusively (non-

supplemented group; n=30) or intravenous fluid in addition to breast milk (supplemented group; n=30) during conventional phototherapy.[11] The mean total serum bilirubin (TSB) levels at the time of enrollment and within 84 hours after phototherapy were not statistically different between two groups.

Demisroy et al and Maisels MJ also showed no significant difference in decrease or rate of drop of serum bilirubin levels with extra fluid therapy.[12,13]

A study by Saiedi et al showed that rate of serum bilirubin decrease per hour was significantly more (P = 0.02) in extra fluid group during 12-24 hours of study period.[14] Similarly, in study by Mehta et al percentage drop in TSB upto 24 hours of study was significantly more in extra fluid group.[15] Tan KL et al showed rate of decrease of serum bilirubin at 24 hours of study was significantly more in group which received both breast feeds and formula feeds as compared to groups which received either breast feeds or formula feeds.[3] The overall rate of decrease of bilirubin concentration during phototherapy exposure was significantly less in-group, which received, only breast-feeds as compared to group, which received formula feeds, or both. Few studies on effect of intravenous fluid supplementation on drop in serum bilirubin levels are tabulated below (Table 3).

CONCLUSION

On the basis of empirical evidences of the current study it can be summarized that additional intravenous fluid supplementation, as per study design, has significantly reduced the serum bilirubin in study group as compared to control group. It may also decrease the need of total duration of phototherapy and exchange transfusion.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Tank P, Tank R, Singh A. Effect of intravenous fluid supplementation on drop in serum bilirubin levels in term babies with severe hyperbilirubinemia. Int J Contemp Pediatr 2018;5:106-9.