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Effect of fluid supplementation with phototherapy in reducing the serum bilirubin levels in severe hyperbilirubinemia

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ABSTRACT

Hyperbilirubinemia otherwise called "jaundice" is yellowish-green pigmentation of the sclera and skin brought about by an expansion in bilirubin creation or an imperfection in bilirubin elimination. Prospective randomized comparative correlational study carried out on babies admitted to NICU in Krishna Hospital. All healthy term babies (= 37 weeks) with non haemolytic hyperbilirubinemia with absolute serum bilirubin =20 mg/dl - = 25 mg/dl from second day of life to fourteenth day of life. Out of 811 babies admitted in NICU during the study period, 52 babies were admitted for severe hyperbilirubinemia in NICU. Thus, the incidence rate was 6.4%.out of these 28 (53.84%) were male and 24 (46.15%) were female. The frequency of extreme hyperbilirubinemia was more in inborn babies (78.88%) than out born babies (21.15%). The frequency of extreme hyperbilirubinemia with respect to birth weight were, Weights between 2000 gms-3000gms were 40 (76.9%) and weight above 3000 gms were 12 (23.07%). The percentage weight loss from the time of birth till admission between enhanced and non enhanced gatherings was comparable. In the study, 28 (53.84%) were delivered per vaginally, 24 (46.15%) were born by LSCS. Most neonates in our study, 31 (59.61%) cases presented with in 2-5 days, 20 cases presented between 6-10 days and only one case between 11-14 days. By unpaired T test both supplemental and non supplemental groups are comparable i.e., the levels of bilirubin, rate of reduction of bilirubin between 2 groups is not significant. By ANOVA test i.e., the levels of bilirubin, rate of reduction of bilirubin in both the groups is highly significant. The complete length of phototherapy required between2 groups is not significant. This information show that organization of extra intravenous liquid in embittered sound, term, breastfed neonates have no useful impact on the pace of serum bilirubin decrease during phototherapy.

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INTRODUCTION

Hyperbilirubinemia otherwise called "jaundice" is yellowish-green pigmentation of the sclera and skin brought about by an expansion in bilirubin creation or a deformity in bilirubin end. Neonatal jaundice is characterized as serum bilirubin focus more prominent than greater than 5mg/dl. It is one of the most common problem in neonatal period estimated to occur in majority of term infants (60%) in first week of life1 and approximately 2% of infants reach total serum bilirubin >20mg/dl (Taksande *et al.*, 2005).

The dread for the degree of 20mg/dl has given on edge minutes to specialists and the family members of the jaundiced newborn child?. To the pediatrician jaundice stays under typical remains the most common and perhaps the most vexing problem in the well baby nursery. It is a cause of concern for the parents as well as for the pediatricians. The colour in jaundice usually results from accumulation in the skin of unconjugated, non polar, lipid soluble, bilirubin pigment (indirect reacting) formed from hemoglobin by the action of heme oxygenase, biliverdin reductive and non enzymatic reducing agents in the reticuloendothelial cells (Bernaldo and de Mattos Segre, 2004). Under typical conditions, the degree of circuitous responding bilirubin in umbilical rope serum is 1-3mg/dl and ascends at a pace of under 5mg/dl/24hrs. Therefore, jaundice gets noticeable on the second - 3 rd day (36-72hrs) as a rule cresting by the third day at 5-6mg/dl and diminishing to underneath 2mg/dl somewhere in the range of fifth and seventh day of life (Bernaldo and de Mattos Segre, 2004). Severe hyperbilirubinemia is the most widely recognized reasons for of neonatal readmissions to hospital. Bilirubin induced neurological dysfunction does not occur without of hyperbilirubinemia. Kernicterus is an uncommon yet crushing condition that is not extinct. It is normally connected with confounding conditions, for example, is inoculation or different reasons for hemolysis, rashness, sepsis, different disease or protected imperfections in hepatic bilirubin freedom (Johnson, 1991). Phototherapy is safe way which has remained as standard treatment in neonatal hyperbilirubinemia. During phototherapy, bilirubin is changed over to less harmful water dissolvable photoisomers, in light of the fact that photoproducts answerable for decrease in serum bilirubin are discharged in pee and bile. So keeping up satisfactory hydration and great pee yield should help improving the adequacy of phototherapy. Phototherapy additionally expands measure of (Oh and Karecki, 1973). Dehydration is also known to be associated with high serum bilirubin levels. Severe hyperbilirubinemic patients have subclinical dehydration at presentation. For these reasons, fluid supplementation is usually given to newborn children experiencing phototherapy (Mehta *et al.*, 2005). While jaundice essentially isn't preventable none the less early identification of undermining bilirubin levels license commencement of phototherapy and forestalls higher hazard and significant expense trade transfusion treatment or kernicterus. Serum bilirubin decreases faster when term neonates with extreme hyperbilirubinemia are given fluids in addition to phototherapy (Tan, 1998). IV fluid supplementation has been shown to decrease the need for blood exchange transfusion and length of phototherapy in neonates with severe non-haemolytic hyperbilirubinemia (Balasubramanian *et al.*, 2012).

In spite of the fact that phototherapy increments torpid water misfortune somewhat, newborn children under phototherapy don't routinely require intravenous liquids. They might be demonstrated in instances of newborn child parchedness, hypernatremia, or failure to ingest satisfactory milk. The standard arrangement of intravenous liquids is disheartened, be that as it may, as they may restrain thirst and reduce oral admission (The Academy of Breastfeeding Medicine Protocol Committee). In another study it was seen that intravenous fluid supplementation has no beneficial effects on the pace of reduction of bilirubin levels alongside phototherapy and recommend a cut of level of 20mg/dl for treating with exchange transfusion (Boo and Lee, 2002).

Thus, there is scarcity of literature on this concept of using intravenous fluids with phototherapy in severe hyperbilirubinemia. So this study is being conducted to evaluate the role of intravenous fluid supplementation in reducing serum bilirubin during conventional phototherapy in term babies with severe hyperbilirubinemia.

Aims and Objectives

1. To evaluate the effectiveness of fluid supplementation in decreasing the rate of serum bilirubin level along with phototherapy.
2. To study the duration of phototherapy in term neonates with severe hyperbilirubinemia.

MATERIALS AND METHODS

Source of data

The study is a Prospective randomized comparative correlational study carried out on babies admitted to NICU in Krishna Hospital, Karad, Maharashtra.

Data Collection

Inclusion Criteria

All healthy term infants ($\geq$ 37 weeks) with non haemolytic hyperbilirubinemia with total serum bilirubin $\geq$20 mg/dl - $\leq$ 25 mg/dl from 2nd day of life to 14th day of life.

Sample Size

All the term infants with non hemolytic severe hyperbilirubinemia admitted to the hospital during the study period from December 2012 to May 2014 will be enrolled in the study.

Consent

Before randomization, informed consent obtained from parents.

Randomization

Total study group was divided into 2 groups randomly by odd and even number method.

OBSERVATIONS AND RESULTS

This was a Randomized prospective comparative correlational study, carried out in NICU, Krishna Hospital and Research Centre, Karad. We studied 52 babies who satisfied inclusion criteria in the study period. In our study of 52 patients with neonatal severe hyperbilirubinemia, 28 (53.84%) were male and 24 (46.15%) were female with, Male to Female ratio of - 1.16: 1. In our study, 41 (78.88%) cases were inborn and 11 (21.15%) cases were outborn. Among the total admissions 811 during the study period, 656 cases were inborn and 155 cases were outborn. The incidence of neonatal severe hyperbilirubinemia with respect to birth weight. Weight between 2000 gms-3000gms was 40 (76.9%) and weight above 3000 gms were 12 (23.07%).28 (53.84%) were delivered per vaginally, 24 (46.15%) were born by LSCS. 31 (59.61%) cases presented with in 2-5 days, 20 cases presented between 6-10 days and only one case between 11-14 days. The mean gestational age of presentation (Mean±SD) in both groups were not significant. By unpaired T test both supplemental and non supplemental groups are comparable i.e., the levels of bilirubin, rate of reduction of bilirubin between 2 groups is not significant. By ANOVA test i.e., the levels of bilirubin, rate of reduction of bilirubin in both the groups is highly significant.

The total duration of phototherapy between supplemented and non supplemented groups were 51.711±5.269 and 56.673±4.752 (hrs) i.e., both groups are comparable.

Discussion

Recent case reports and experience of neonatologists and "bilirubinologists" who provide expert advice in medico legal cases suggest the possible re-emergence of kernicterus from a state of near extinction to one that is of concern to paediatricians (Penn *et al.*, 1994). Because there has been no uniform surveillance for reporting of such cases over the last three to four decades, no uniform case definition for kernicterus and most important no denominators for the case reports listed, we have no way of accurately comparing the incidence of kernicterus in population today with the incidence in last 30 years. Recognizing bilirubin induced neurologic dysfunction (BIND) as a matter of public health concern, the AAP developed a detailed consensus based practice parameter for the management of hyperbilirubinemia in healthy term newborns and institution of preventive phototherapy. Serum bilirubin decreases faster when full term neonates with severe hyperbilirubinemia are given fluids in addition to phototherapy (Tan, 1998). IV fluid supplementation has been shown to decrease the need for blood exchange transfusion with severe non-haemolytic hyperbilirubinemia76. In another study it was seen that intra venous fluid supplementation has no beneficial effects on the rate of reduction of bilirubin levels along with phototherapy and recommend a cut of level of 20mg/dl for treating with exchange transfusion (Mehta *et al.*, 2005) 77-83. There is paucity of literature on this concept of using intra venous fluids with phototherapy in severe hyperbilirubinemia. So the study is being conducted to compare the effectiveness of fluid supplementation with and without phototherapy in full term neonates with severe hyperbilirubinemia.

Incidence of severe hyperbilirubinemia

Total number of NICU admissions during study period were 811, out of which, 52 neonates developed severe hyperbilirubinemia. Thus the incidence rate was 6.4%. The incidence of severe hyperbilirubinemia in Canada (assuming about 320 000 live births per year) would be 1 in 2480 live births (Barrington and Sankaran, 2007). The incidence of severe neonatal hyperbilirubinemia is higher in Asians than in whites (Huang *et al.*, 2004). (Najib *et al.*, 2013) studied the incidence of severe hyperbilirubinemia with 15 percent in all neonates admitted in NICU, Namazi Hospital, Shiraz University of medical sciences, Shiraz, IR Iran (Najib *et al.*, 2013).

Sex distribution

In present study male babies had shown greater incidence than female babies. With male: female ratio was 1.16:1. This observation co-relates with other studies.

Distribution of cases in nicu

In our study, 41 (78.88%) cases were inborn and 11 (21.15%) cases were outborn. Among the total admissions 811 during the study period, 656 cases were inborn and 155 cases were outborn. N Y Boo and H T Lee in their study noted that inborn (%) 16 (59.3) and 22 (81.5) in non supplemented and supplemented group (Boo and Lee, 2002).

Incidence of severe hyperbilirubinemia with respect to birthweight

The incidence of severe hyperbilirubinemia with

respect to birth weight. Weights between 2000 gms-3000gms were 40 (76.9%) and weight above 3000 gms were 12 (23.07%) N Y Boo and H T Lee in their study of 54 neonates noted that mean birth weight (g- grams) 3003g in non supplemented and 3147g in supplemented group (Boo and Lee, 2002). (Saeidi *et al.*, 2009) in their study of 100 neonates noted that mean birth weight between supplemented and non supplemented groups were 3000g and 3075g (Saeidi *et al.*, 2009).

Ercentage weightloss analysis

In our study, the percentage weight loss from the time of birth till admission between supplemented and non supplemented groups was comparable. In a study conducted by (Iranpour *et al.*, 2004) similar results i.e, both the groups were comparable80

Incidence with respect to mode of delivery

In our study, 28 (53.84%) were delivered per vaginally, 24 (46.15%) were born by LSCS. N Y Boo and H T Lee in their study of 54 neonates noted that spontaneous vertex delivery (%) 74.1 and 74.1 in non supplemented and supplemented respectively and the rest were born by LSCS (Boo and Lee, 2002). (Iranpour *et al.*, 2004) in their study conducted on 60 neonates noted that spontaneous vertex delivery (%) 53.3 and 60 in non supplemented and supplemented respectively and the rest were born by LSCS (Iranpour *et al.*, 2004).

Day of Presentation

In our study 31 (59.61%) cases presented with in 2-5 days, 20 cases presented between 6-10 days and only one case between 11-14 days N Y Boo and H T Lee in their study noted the age of admission ranged from 4 to 11 days in the enteral group, and from 2 to 10 days in the intravenous group (Boo and Lee, 2002).

Laboratory Bilirubin characteristics

In our study by applying unpaired T test both supplemental and non supplemental groups are comparable i.e., the levels of bilirubin, rate of reduction of bilirubin between 2 groups is not significant. And by ANOVA test i.e., the levels of bilirubin, rate of reduction of bilirubin in both the groups is highly significant. N-Y Boo and H-T Lee in their investigation saw that there was no critical distinction in the mean roundabout serum bilirubin (ISB) level at the hour of admission to the NICU between the enteral (359 $\pm$ 69 μmol/L [mean $\pm$ SD]) and intravenous gathering (372 $\pm$ 59 μmol/L; P = 0.4). The mean paces of reduction in iSB during the initial 4 h of phototherapy were likewise not altogether unique between the enteral gathering (10.4$\pm$ 4.9 μmol/L per h) and intravenous gathering (11.2 $\pm$ 7.4μmol/L per h; P = 0.6) (Boo and Lee, 2002). (Al-Masri, 2012), Jordan in an investigation led, saw that the mean all out serum bilirubin (TSB) level on the confirmation was not measurably extraordinary. The mean pace of decline in TSB levels during the initial 6 hours of phototherapy were 1.3mg/dl and 1.2mg/dl in enhanced and non-enhanced gatherings, separately. The mean TSB levels inside 72 hours after phototherapy were not measurably unique between two groups (Al-Masri, 2012). (Easa, 2013) in his examination directed, 2010, Sixty four sound bosom took care of neonates with non-hemolytic hyperbilirubinemia (all out serum bilirubin > 18 mg/dL to < 22 mg/dL). The outcomes were mean complete serum bilirubin (TSB) levels at the hour of enlistment and inside 84 hours after phototherapy were not measurably extraordinary between two groups (Easa, 2013).

Total Duration of Phototheraphy

The all out span of phototherapy among enhanced and non enhanced gatherings were 51.711and 56.673 (hrs) i.e., the two gatherings are practically identical. Comparable outcomes were noted in another examination led by (Iranpour *et al.*, 2004), in their investigation indicated the span of phototherapy required in enhanced and non-enhanced gatherings was 58 and 63.20 hours, respectively (Iranpour *et al.*, 2004). (Easa, 2013) in his examination led, 2010 the term of phototherapy required in both enhanced and non enhanced gatherings was 48hr (Easa, 2013).

CONCLUSIONS

This information show that organization of extra intravenous liquid in embittered sound, term, breastfed neonates have no useful impact on the pace of serum bilirubin decrease during phototherapy.

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Conflict of Interest

Nil

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