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Study of haematological parameters in neonates receiving phototherapy for neonatal hyperbilirubinemia in a tertiary hospital

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Abstract
Background: Neonatal Hyperbilirubinemia (NH) is commonest abnormal physical finding during the first week of life. Early discharge of healthy term newborns has become a common practice, because of various reasons. Neonatal Hyperbilirubinemia (NH) is the most common cause for readmission during the early neonatal period and is a cause of concern for the parents as well as for the pediatricians. Hence appropriate management of Neonatal Hyperbilirubinemia is of paramount importance. Phototherapy plays a significant role in prevention and treatment of hyperbilirubinemia. However, this treatment modality may itself result in inherent complications.
Objectives: To evaluate the hematological changes in neonates receiving phototherapy for neonatal hyperbilirubinemia.
Methods: A prospective hospital based comparative study conducted on 100 eligible neonates admitted in the Neonatal Intensive Care Unit receiving phototherapy at Krishna institute of medical sciences, Karad. from December 1st 2017 to November 30th 2018. A predesigned proforma has aided the enrollment of newborns into the study according to AAP guidelines. Serum bilirubin and hematological parameters were determined before and after termination of phototherapy. The first samples were considered as controls. A comparative study was made between before and after phototherapy groups to determine the changes in hematological parameters.
Results: The study group included 100 neonates that were managed with phototherapy. Male: Female ratio was 1:1.22. Incidence of low birth weight babies was 26% and preterm was 19%. Mean birth weight and gestational age was 2.82±0.3 kg and 38.4±1.5weeks respectively. Mean duration of phototherapy was 30.20±10hrs. The mean Hemoglobin was 17.15+/-0.06 and 16.78+/-0.05, mean PCV was 50.74+/-0.52 and 49.76+/-0.51, mean Retic count was 2.09+/-0.13 and 2.72+/-0.10,mean Total count was 16466.500+/163.6 and 17368+/-151.83, mean Platelet count was 2.15+/-0.28 and 1.84+/-0.01before and after phototherapy respectively. In our study there was a significant change in mean Hemoglobin, mean PCV and mean Retic count after phototherapy when compared to before phototherapy. Whereas there was no significant change in mean total counts including mean neutrophils and mean lymphocytes before and after phototherapy and also on mean platelet count after phototherapy when compared to before phototherapy. How ever there was a significant decline in mean platelet count in LBW babies when compared to normal birth weight babies.
Conclusion: The study shows that there was significant effect of phototherapy on Hemoglobin, PCV and Retic count, whereas no significant effect on Total count and platelet count. However there is a significant decline in platelet count in LBW babies and they should be monitored for changes in platelet count during phototherapy.

Keywords: phototherapy, significant, phototherapy, neutrophils

Introduction
Neonatal hyperbilirubinemia (NH) is commonest abnormal physical finding during the first week of life. Over two third of newborn babies develop clinical jaundice. The physical finding like yellowish discoloration of the skin and sclera in newborns is due to accumulation of unconjugated bilirubin. In most infants, unconjugated hyperbilirubinemia reflects a normal physiological phenomenon [1].
NH nearly affects 60% of term and 80% of preterm neonates during first week of life. 6.1% of well term newborn have a serum bilirubin over 12.9 mg%. Serum bilirubin over 15 mg% is found in 3% of normal term newborns. Nevertheless untreated, severe unconjugated hyperbilirubinemia is potentially neurotoxic and conjugated hyperbilirubinemia is a harbinger of underlying serious illness.
NH is a reflection of liver's immature excretory pathway for bilirubin and is the most common reason for readmission of neonates in first week of life in current era of postnatal discharge from hospital [3]. Neonatal hyperbilirubinemia is a cause of concern for the parents as well as for the pediatricians.
Premature babies have much higher incidence of neonatal jaundice requiring therapeutic intervention than term neonates. Hyperbilirubinemia was found to be the most common morbidity 65% among 137 extremely low birth weight neonates born over a period of 7 years in AIIMS.
Elevated levels of unconjugated bilirubin can lead to bilirubin encephalopathy and subsequently kernicterus, with devastating, permanent neurodevelopment handicaps [6]. Conjugated Hyperbilirubinemia indicates potentially serious hepatic disorders or systemic illnesses. Hence appropriate management of neonatal hyperbilirubinemia is of paramount importance.
Hyperbilirubinemia can be treated either by phototherapy or exchange transfusion or pharmacologic agents.

Phototherapy plays a significant role in prevention and treatment of hyperbilirubinemia. The main demonstrated value of phototherapy is that it reduces the need for exchange transfusion. As any treatment has its side effects, phototherapy also have its adverse effects like hyperthermia, feed intolerance, loose stools, skin rashes, bronze baby syndrome, retinal changes, dehydration, hypocalcemia, redistribution of blood flow and genotoxicity.

Unlike other side effects, a very few studies are currently available that depicts the side effects of phototherapy on hematological parameters with controversial results. Hence the present study is undertaken to find out any significant changes in hematological parameters.

Aims and Objectives of Study

To evaluate the hematological parameters in neonates receiving phototherapy for neonatal hyperbilirubinemia in a tertiary care rural hospital at Krishna institute of medical sciences, Karad.

Materials and Methods

Source of Data

A prospective hospital based comparative study conducted on 100 eligible neonates admitted in the Neonatal Intensive Care Unit receiving phototherapy at Krishna institute of medical sciences, Karad from December 1st 2017 to November 30th 2018.

Period of stud

Ten months.

Study population

A total of 100 neonates born in Krishna institute of medical sciences, Karad.

Method

Observational study

Inclusion criteria

The Term and Preterm Neonates receiving phototherapy for unconjugated hyperbilirubinemia without any comorbidities like Birth asphyxia, septicemia, renal failure, etc.

Exclusion criteria

Neonates with Conjugated Hyperbilirubinemia Neonate with co-morbidities like Birth asphyxia, Septicaemia Renal failure. Abnormal haematological parameters detecte pre phototherapy.

Venous blood samples were collected from the neonates included in the study and sent for total bilirubin, direct bilirubin, Hematological parameters (Hemoglobin, Total count, differential count, Haemotocrit, Reticulocyte count, Platelet count) and blood group.

Total and direct bilirubin is measured by Diazo method (Diazotized sulfanilic test). Principle - Bilirubin reacts with diazotized sulfanilic acid to produce azobilirubin which is quantified by spectrometry. Both direct and indirect bilirubin couple with diazo in the presence of cetremide. The terms ‘direct’ and ‘indirect’ are equivalent to conjugated and unconjugated fractions.

Blood group of newborn analyzed by antisera method.

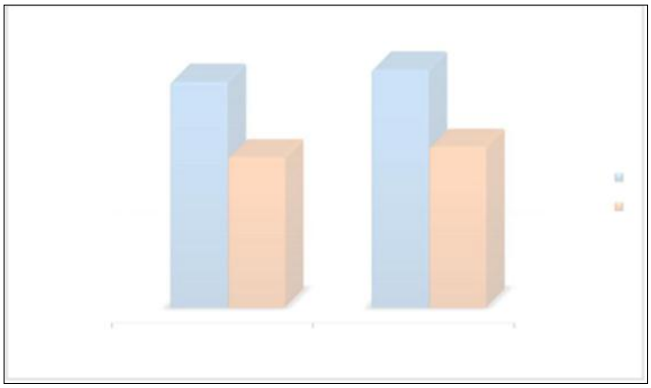

Fig 1: Comparison of mean total bilirubin before and after phototherapy with birth weight

Statistical Methods

Proportions will be compared using chi-square test. All data of various groups will be tabulated and statistically analysed using suitable statistical tests (Student's t test). Both descriptive and inferential statistics were employed for data analysis.

Results

The study was conducted on 100 neonates admitted to NICU Krishna institute of medical sciences, Karad for phototherapy. Proforma was filled for each newborn. Data were analyzed using appropriate statistical software like SAS 9.2 and SPSS 15.0.

In our study group, the incidence of males and females were 45% (45) and 55% (55) respectively. Male: Female ratio was 1: 1.22. Incidence of low birth weight babies was 26% Mean birth weight was 2.83±0.3kg. In our study group, the incidence of preterm babies was 19% (19) compared to 81% (81) Term babies(37wks-42wks). The incidence of pre term male babies was 14.5% (10) vs preterm female 20% (9) in our study group. Mean gestational age in the study group was 38.48±1.5 weeks. 60% of the study group was born by normal vaginal route and 40% by caesarian section. In the study group, 65% neonates were born to primi mothers and 35% born to multigravida mothers.

In our study group, the mean Hemoglobin before photo therapy was 17.05±0.14gm% and 17.17±0.07gm% in preterm and term babies respectively. The mean Hemoglobin after phototherapy was 16.68±0.16gm% and 16.76± 0.05gm% in preterm and term babies respectively. The decline in the mean Hemoglobin was noted in both the groups. The p value obtained was ≤0.001. Thus, it is considered to be statistically significant. In our study grou p, the mean PCV before phototherapy was 50.98 ±0.44% and 50.6±0.7 in preterm and term babies respectively. The mean PCV after phototherapy was 50.0±0.49% and 49.5 ±0.66% in preterm and term babies respectively. The decline in the mean PCV was noted in both the groups. However the decline was found to be more statistically significant in Term babies ($p<0.001$) than in preterm babies ($p=0.04$). In our study group, the mean.

Retic count before phototherapy was 3.01±0.26% and 3.08±0.15% in preterm and term babies respectively. The mean Retic count after phototherapy was 2.09±0.13% and 2.72±0.10% in preterm and term babies respectively. The decline in the mean PCV was noted in both the groups. The

p value obtained was ≤0.001. Thus, it is considered to be statistically significant. The mean value changes in Total count and Platelet count was found to be non-significant (p>0.05). In our study grou p, the mean serum Platelet count before phototherapy was 1.93±0.03 lak/cumm and 2.01±0.38 lak/cumm in low birth weight babies and normal weight respectively. The mean serum Platelet count after phototherapy was 2.15±0.28 lak/cumm and 1.84±0.01 lak/cumm in low birth weight babies and normal weight respectively. The decline in th e mean platelet count was noted in both the groups. By chi-square test using test for paired sample means, however the decline was found to be statistically significant in LBW babies (p<0.001) than in normal weight (p=0.194) which was not statistically significant.

In our study group, the mean PCV before phototherapy was 51.3±0.36% and 50.5±0.71 in low birth weight babies and normal weight respectively. The mean PCV after phototherapy was 5 0.1±0.33% and 49.5±0.7% in low birth weig ht babies and normal weight respectively. The decline in the mean PCV was noted in both the groups. By chi-square test, using test for paired sample means, the p value obtained was <0.001 in both the groups. Thus, it is considered to be statistically significant.

In our study group, the mean Retic count before phototherapy was 2.96±0.19% and 3.12±0.17% in low birth weight babies and normal weight respectively. The mean Retic count after phototherapy was 2.72±0.17% and 2.82±0.13% in low birth weight babies and normal weight respectively. The decline in the mean Retic co unt was noted in both the groups. By chi-square test, using test for paired sample means, the p value obtained was <0.001 in both the groups. Thus, it is considered to be statistically significant. The mean value changes in Total count was found to be n on-significant (p>0.05) in both the groups.

Overall, there was significant decline in Hemoglobin, PCV and Retic count along with total bilirubin following phototherapy.

Table 1

Variables	Phototherapy	phototherapy	t value	P value
Primi(n=65)				
Total Bilirubin	17.35±0.12	11.75± 0.14	48.44	<0.01**
Hemoglobin	17.15±0.06	16.78±0.05	9.4	<0.01**
Total count	16466.500+/163.6	17368.6+/151.83	3.34	0.001**
Platelet count	2.15±0.43	1.84±0.02	1.26	0.209
PCV	50.74±0.52	49.76±0.51	7.04	<0.01**
Retic count	2.09±0.17	2.72±0.14	6.97	<0.01**
Multi(n=35)				
Total Bilirubin	17.33±0.11	11.54±0.19	36.5	<0.01**
Hemoglobin	17.07±0.10	16.72±0.40	7.02	<0.01**
Total count	14792.8±256.8	14838.5±237.1	-0.72	0.471
Platelet count	1.94±0.01	1.79±0.02	5.45	<0.01**
PCV	50.97±0.34	50.05±0.24	5.84	<0.01**
Retic count	2.94±0.21	2.72±0.16	3.77	<0.01**

Discussion

Neonatal Hyperbilirubinemia (NH) is the commonest abnormal physical finding during the first week of life. Early discharge of healthy term newborns from the hospital after delivery has recently become a common practice for medical, social and economic reasons. However, it has been shown that newborns whose post-delivery hospital stay < 72 hours are at a significantly greater risk for readmissions than those whose stay is >72 hours. NH is the most commonly reported cause for readmission during the early neonatal period. There is concern regarding early discharge of healthy term newborns due to reports of bilirubin induced brain damage resulting in sequelae like kernicterus.

The need for early detection of hyperbilirubinemia in the early discharged newborns from the hospital is therefore important. It is crucial to catalogue the babies who are at risk for significant jaundice before they are sent away from the hands of the pediatricians, and to prevent the potential bilirubin neurotoxicity so that, many of the significantly jaundiced neonates could see the light of the day from the nightmare of bilirubin encephalopathy. Phototherapy has emerged as the most widely used form of treatment and is the current therapy of choice to reduce severity of neonatal unconjugated hyperbilirubinemia.

As any treatment has its side effects, phototherapy also has. Unlike other side effects a very few studies are currently available that depicts the adverse effects of phototherapy on hematological parameters. A few studies in the recent past, have stressed on the incidence of thrombocytopenia or increased platelet count following phototherapy and very few studies till date regarding the effect of phototherapy on all Hematological parameters.

Hence our study was designed to determine the hemotological changes in neonates receiving phototherapy for neonatal jaundice.

The present study included a total of 100 neonates which comprised of 17 pretermsand 83 term neonates. Sanjeev *et al*. 63(2011) has 18 preterms and 82 term babies in his study whereas Ahmadpour *et al*. 61 (2013), Alireza *et al*. l64 (2011), Sakha *et al*. 65 (2006) included only term neonates.

Conclusions

Effect of phototherapy was seen on Hemoglobin, PCV and Retic count where there was a significant change in there mean values after phototherapy and was seen in preterm, term, LBW and normal birth weight neonates. There was no significant effect of phototherapy on total count, neutrophils, lymphocytes and platelet count. There was a decline in mean platelet counts after phototherapy which was seen in all groups but the decline in LBW neonates was significant when compared to normal birth weight babies.

References

1. Singh M. Care of the Newborn. 7th ed. New Delhi: Sagar Publications. 2010; p254-74.
2. Maisels MJ. Jaundice. In: Avery GB, Fletcher MA, MacDonald MG (eds).
3. Neonatology: Pathophysiology and Management of the Newborn. 5th ed.
4. Lippincott Williams and Wilkins: Philadelphia, 1999, p765-820.
5. Maisels MJ, Kring E. Length of stay, jaundice, and hospital readmission. Pediatrics 1998; 101:995-998.
6. Gregory MLP, Martin CR, Cloherty JP. Neonatal Hyperbilirubinemia. In: Cloherty JP, Eichenwald EC, Hansen AR, Stark AR (eds.) Manual of neonatal care. 7th ed. Philadelphia: Lippincott Willams and Wilkins, 2012; p304-339.

7. Narayana S Aggarwal, Upadhyay A, Deorari AK, Sindh M, Paul VK. Survival and morbidity in Extremely Low Birth Weight (ELBW) infants. Indian Pediatrics 2003; 40(2):130-5.
8. Maisels MJ, Newman TB. Kernicterus in otherwise healthy, breast-fed term newborns. Pediatrics 1995; 96(4):730-733.
9. Sourabh Dutta. Phototherapy for neonatal jaundice - recent advances and controversies. Journal of Neonatalogy. 2001; 1(1):39-44.
10. Papavramidou N, Fee E, Christopoulou-Aletra H. Jaundice in the Hippocratic Corpus. Journal of Gastrointestinal Surgery. 2007; 11(12):1728-1731.
11. Madan A, Macmohan JR, Stevenson DK. Neonatal Hyperbilirubinemia in the Newborn. In: Mac Donald (eds.) Avery[s Neonatology. 8th ed. Philadelphia: Lippincott Williams & Wilkins. 2010; p1226-1257.
12. Brown AK. Kernicterus: Past, present and future. Neoreviews 2003; 4:e33-e40.
13. Panaroli D. Iatrologismorum *sive observationum medicinalium* Pentacostaequartaobs. 1654; 44:137.
14. Juncker DL. Conspectus Medicinae Theoreticopracticae. Halae Magdeburgeicae 1724; 717.
15. Hansen TW. Pioneers in the Scientific Study of Neonatal Jaundice and Kernicterus. Pediatrics. 2000; 106(2):e15.