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Clinical profile and Outcome of Newborn with Hyperbilrubinemia undergoing double volume exchange transfusion (DVET) in a Tertiary Care Hospital

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Abstract:
Background: *Jaundice is the commonest abnormal physical finding during the first week of life. Over two third of newborn babies develop clinical jaundice develop clinical jaundice and by adult standard almost all newborns are jaundiced during early days of life. High level of unconjugated bilirubin cross blood brain barrier (BBB) and cause bilirubin encephalopathy/ Kernicterus. DVET is the most effective and reliable method to reduce birth level and prevent kernicterus.*
Material & Methods: *This is a prospective cohort study. Neonates who underwent DVET for hyperbilirubinemia from 1st June 2021 to 31st December 2021 were included in the study.*
Results: *One hundred and twelve neonates underwent DVET. ABO incompatibility was the commonest cause (40.2%). Hypocalcemia was a predominant complication, along with hypoglycemia.*
Conclusion: *ABO incompatibility was the commonest cause for DVET. Very few neonates faced any adverse events. Mortality was 3.6%.*

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I. Introduction

Jaundice is the commonest abnormal physical finding during the first week of life. Over two third of newborn babies develop clinical jaundice develop clinical jaundice and by adult standard almost all newborns are jaundiced during early days of life. High level of unconjugated bilirubin cross blood brain barrier (BBB) and cause bilirubin encephalopathy/ Kernicterus. The exact pathogenesis of bilirubin encephalopathy is controversial and complex but is related to the interplay between level of UCB which is lipid soluble[1], gestational maturity of infant[2] and integrity of BBB[1].

DVET is the most effective and reliable method to reduce birth level and prevent kernicterus. Exchange transfusion (ET) removes partially hemolysed and antibody coated RBC as well unattached antibodies and replace them with donor RBC, lacking sensitising antigen. DVET has high risk of complications associated with the procedure. Some of the complications are hypocalcemia, hypomagnesmia, hypoglycemia and acid base imbalance[2].

Under this backdrop the study was done in the Department of Neonatology, GMCH, to determine the clinical profile and outcome of newborn with hyperbilirubinemia undergoing DVET.
Institutional ethical Committee approval was taken.

II. Materials & Methods

This is a prospective cohort study.Neonates who underwent DVET for hyperbilirubinemia from1st June 2021 to 31st December 2021 were included in the study. Only term newborns≥ 37 weeks of gestation were included in the study.Newborns undergoing ET for causes other that neonatal hyperbilirubinemia such as sepsis, polycythaemia and anaemia were excluded from the study.Newborns with HIE, major congenital malformations were also excluded from the study. The neonates who had high bilirubin level were emergently treated with phototherapy after sending the relevant investigations and arranged for DVET. Neonates were managed according to AAP 2004 guidelines[10].
DVET (160ml/kg) was performed using push pull technique through umbilical vein or radial artery using fresh whole blood.
Prior to exchange transfusion investigations sent were CBC, serum bilirubin, ABO Rh typing, reticulocyte count, hematocrit, serum electrolytes, RBS, RFT and G6PD. Post ET serum bilirubin, haemoglobin, serum electrolytes and RFT were sent.

Adverse events during and immediate post exchange transfusion were documented. Outcome was determined as discharge with advice or death.

III. Results

DVET was performed in 112 neonates during the study period from 1st June 2021 to 31st December 2021. The general characteristics of the study are shown in Table1.

Table 1:

Characteristics		
Gender	Males	70 (62.5%)
	Females	42 (37.5%)
Place of delivery	Inborn	60 (53.6%)
	Outborn	52 (46.4%)
Mode of Delivery	NVD	67 (59.8%)
	LSCS	45 (40.2%)

Causes of hyperbilirubinemia included ABO incompatibility (40,2%), Rh incompatibility (9%), G6PD deficiency (21.4%) and idiopathic causes (29,4%). ET was done once in 108 (96.4%) and twice in 4 (3.6%). Complications noted during and after exchange transfusion are shown in Table 2.

Table2:

Adverse Event	
Hypocalcemia	12
Hypoglycemia	3
Sepsis	1
Apnea	1

At the time of admission, 20 (17.8%) neonates who presented with bilirubin encephalopathy of which 9 were in Stage 1, in Stage 2, 9 and 2 were in Stage 3. Neonates who died were 4 (3.6%), two each in Stage 2 and Stage 3.

IV. Discussion:

The objective of the present study was to determine the clinical profile and outcome of newborn with hyperbilirubinemia who underwent DVET in our set up. A total of 116 ET was performed during the study period. The total number of neonates studied were 112. Four neonates underwent DVET twice (3.6%) similar to Kanodia et al[4] Male preponderance was observed as 70 (62.5%) were males and 42 (37.5%) were female neonates. The common mode of delivery was NVD in 67 (59.8%) case, same as Pradhan et al[3] (70.2%) and Kiran Kumar et al[7] (70.4%). LSCS accounted for 45 cases (40.2%) which is same as Kanodia et al[4].

ABO incompatibility was the most common cause for hyperbilirubinemia in our study in our study, 40.2%. This is comparable with available literature, such as Kanodia et al[4] (33%), Weng & Chiu[5](24.7%) and Yadav etal[8] (50%). In our study Rh incompatibility was the cause in 10 patients (9%), idiopathic causes 33(29.4%) comparable with Kanodia et al[4] where Rh incompatibility was 17% and idiopathic causes was 20%. G6PD deficiency was seen in 24 neonates which is again comparable with available literature.

It was seen that of the neonates who underwent DVET, 60 (53.6%) were inborn and the rest 52 (46.4%) were outborn which is similar to Kanodia et al[4]62.5% and 43.8% respectively.

Following DVET, the most common complication seen was hypocalcemia in 12 (10.7%) neonates which is lower than that seen in other studies, such as Kanodia et al[4] (50%). The other events were hypoglycemia, sepsis and apnea.

Neonates who underwent repeat DVET was 4.

At the time of admission, 20 (17.8%) neonates who presented with bilirubin encephalopathy of which 9 were in Stage 1, in Stage 2, 9 and 2 were in Stage 3. Neonates who died were 4 (3.6%), two each in Stage 2 and Stage 3. The mortality rate is comparable with Kanodia et al[4](3%), whereas Pradhan et al[3] reported zero mortality.

V. Conclusion:

In our study ABO incompatibility was the most common cause for DVET. So anticipation of jaundice in mothers with blood group O and timely intervention can decrease the need for DVET.

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