Original Research

# NEONATAL HYPERBILIRUBINEMIA DUE TO MINOR BLOOD GROUP INCOMPATIBILILITY (C antigen) IN A NEWBORN

**Dr. Madhu Dharshini S R[1], Dr. Monisha S[2], Dr. Mohamed Salman J[3], Dr. Deepana P[4], Dr. Archana Dinaraj[5], Dr. Raj Parath R[6], Dr. Ganavi Ramagopal[7*]**

[1]Post Graduate, Department of Paediatrics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[2]Post Graduate, Department of Pathology, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[3]Post Graduate, Department of Paediatrics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[4]Post Graduate, Department of Pathology, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[5]Senior Resident, Department Of Paediatrics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[6]Assistant Professor, Department Of Paediatrics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
[7]Professor and HoD, Department Of Paediatrics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur 621212.
**Corresponding Author:** Dr. Ganavi Ramagopal
Professor and HoD, Department Of Paediatrics, DSMCH, Siruvachur, Perambalur 621212.
**Email:** ggganavi10@gmail.com

## ABSTRACT

Anti-c is the second most common cause of severe HDNB after anti-D. We present in this article, a case of HDNB due to anti-c antibody incompatibility, associated with hyperbilirubinemia, which is a rare cause of newbornanemia. A Late Preterm 36 weeks 3 Days GA Female baby with birth weight of 2360 grams, Bilirubin total was 16 mg/dl on Day 1, DCT was positive, Hb 9.8 gm/dl. Then minor blood group incompatibility was suspected and sent for analysis. Meanwhile baby was given Intravenous Immunoglobulin @1gm/kg over 6hrs. Extended Rh phenotyping turned out to be Anti-c antibody positive in mother's serum causing alloimmune hemolyticanemia in baby. Anti-c antibodies may occur due to prior exposures such as blood transfusions, abruptio placenta, spontaneous abortion, previous cesarean section. In newborns presenting with evidence of neonatal jaundice due to hemolysis not due to Rh and ABO incompatibilities, possibility of minor blood group incompatibility should be considered. Anti-C minor blood group incompatibility should be considered in the setting of hemolysis and persistent hyperbilirubinemia diagnosis and management can avert morbidity and mortality. There is a necessity for introduction of antibody screening for pregnant woman as a part of antenatal care in order to reduce burden of HDNB.

**Keywords:** Neonate, Hemolytic Disease of Newborn, Hyperbilirubinemia, Minor Group Incompatibility, C Antigen, Exchange Transfusion.

## INTRODUCTION

Hemolytic disease of the fetus and newborn (HDN) is a disease that is caused by maternal alloantibodies to the fetal red blood cells. It occurs due to an incompatibility between the fetal/neonatal and maternal blood, leading to the destruction of fetal/neonatal red blood cells (RBCs) and resulting in hyperbilirubinemia during the neonatal period. The primary causes of HDN include ABO and Rh incompatibilities, which are responsible for clinically significant hyperbilirubinemia.

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In addition to these common causes, subgroup incompatibilities contribute to 3-5% of all cases of neonatal jaundice1. The importance of minor blood group incompatibilities has increased in the etiology. The most frequently encountered subgroup incompatibilities involve non-D Rh antigens (c, C, E, e), Kell, Duffy, Kidd, and MNS antigens. These incompatibilities can range from mild, subclinical hemolysis to severe hemolysis, which may necessitate an exchange transfusion. The incidence of HDN due to subgroup mismatches has been rising significantly. The incidence of subgroup incompatibilities are anti-D 18.4%, anti-E 14%,anti-C 4.7%, anti-Kell 22%, anti-MNS 4.7%, Duffy 5.4%, and JKa 1.5%3. Children with minor blood group incompatibility may present with a range of clinical symptoms, from subclinical hemolysis with

 

mild laboratory abnormalities to active hemolysis with severe jaundice, anemia, and potentially life-threatening complications. Symptoms may include pallor, lethargy, and jaundice, which can appear within the first 24-48 hours of life3. Laboratory findings may reveal elevated indirect bilirubin, lactate dehydrogenase (LDH), and reticulocyte count, with decreased hemoglobin and hematocrit. In severe cases, active hemolysis can lead to heart failure, kernicterus, and neurological damage, emphasizing the importance of early detection and treatment. Anti-C antibodies may occur due to exposures, such as fetomaternalhemorrhage, abruptio placentae, spontaneous or therapeutic abortion, cesarean delivery, ectopic pregnancy or transfusion. This article discusses a case of a newborn with 'c' subgroup incompatibility, who presented with clinical signs of hemolysis, including anemia, hyperbilirubinemia, and a positive both direct and indirect Coombs test3. The condition was managed with, intensive phototherapy, and intravenous immunoglobulin (IVIG),Intravenous immunoglobulin (IVIG) has been used as an alternative treatment modality for HDN, as it has been shown to decrease the need for red blood cell transfusion4.

## PRESENTATION OF CASE

A 36 Weeks 3 Days female neonate, 2.36Kg, born to 24 yrs old 2nd gravida mother through Emergency LSCS,cried immediately after birth.Born out of non consanguineous marriage, 2nd by order delivered through Emergency cesareansection(Ind:Previous LSCS in labour) .It was booked pregnancy with regular antenatal visits and normal antenatal ultrasounds.Breast feeding was initiated within first hour of life and continued thereafter.baby passed urine and meconium.. Baby developed yellowish discolouration (icterus) upto palms and soles within 24 hrs of life(around 14 hours of life) but was feeding well,there were no signs of bilirubin encephalopathy .On NICU admission ,child general condition was good with normal vitals.Child was deeply icteric observed till thighs ;pallor was present.Child was active ,alert with good spontaneous activity and normal cry ,normal neonatal reflexes and open anterior fontanelle at level with respiratory and cardiovascular findings were normal.There is no risk factor for sepsis,with maternal gestational Hypertension on T.labetalol from 24th week of gestation and had no Congenital anomaly.Serum bilirubin at 16th hours of life was 16.0 mg/dl with indirect bilirubin 15.2 mg/dl .Laboratory investigations demonstrated mother and baby blood group to be AB POSITIVE and B POSITIVE.Reticulocyte count was 12% and Positive DCT.Serial bilirubin samples were taken and evaluated.Hb-9.8 gms% PCV -26% TLC -17500 cells/cu.mm and platelet count -5.4 lakhs/cu.mm .Thus,decision was made and intensive triple surface phototherapy was given.Mother ICT done at Day 2 of life which came as positive.At Day 3 of life TSBR-14(Phototheraphyrange-16),Hb-8.2g/dl,Intravenous immunoglobulin(1g/kg) given .No apparent cause for immune haemolytic disease such as Rh and ABO incompatibility was not present and DCT was positive.Further investigation for minor blood group incompatibility was done which revealed anti c antibody was present in mother and C antigen in newborn.The established our diagnosis of anti c haemolytic disease due to minor blood group c incompatibility as a cause of hyperbilirubenimia in neonate.Since DCT was positive,IVIG was given to child.A Final diagnosis of neonatal hyperbilirubenimia in late preterm,appropriate for gestational age ,female neonate due to anti c alloimmunisation was made.Later, Hemoglobin levels stabilized and bilirubin levels showed a falling trend.

Table 1: Bilirubin-Serial value and ranges

| HOL | 16 HOL | 20 HOL | 23 HOL | 25 HOL | 36 HOL | 41 HOL | 61 HOL |
|---|---|---|---|---|---|---|---|
| TSBR(mg/dl) | 16.0 | 17.1 | 15.9 | 16.1 | 15.2 | 15.9 | 14.0 |
| PT-Range | 9.8 | 10.5 | 10.8 | 12.0 | 13.0 | 14.0 | 16.0 |
| ET-Range | 17.0 | 18.0 | 18.9 | 19.8 | 21.0 | 22.0 | 23.0 |

Table 2: Hemoglobin-Serial value

| Days of Life | Day-1&2 of life | Day-3 of Life | Day-4 of life |
|---|---|---|---|
| Hemoglobin(g/dl) | 9.8 | 8.2 | 7.8 |

Table 3: Result of Phenotype Analysis and Antibody Screening In Mother

| Antigen Detection | Mother |
|---|---|
| D | 4+ |
| C | 4+ |
| c | 0 |
| E | 4+ |
| e | 4+ |
| INDIRECT COOMBS TEST(MOTHER) | 3+ |

| | |
|---|---|
| DIRECT COOMBS TEST (BABY) | 2+ |
| ANTIBODIES RESPONIBLE FOR HEMOLYSIS | ANTI c antibody in mother |

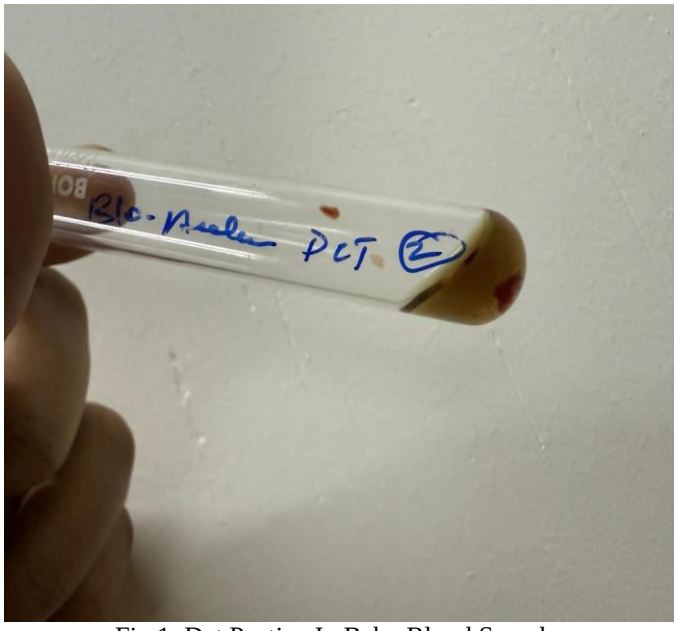


Fig 1: Dct Postive In Baby Blood Sample

## DISCUSSION

Traditionally RhD alloimmunization had been the most common cause of HDNB. Introduction of antiD immunoglobulin prophylaxis in both antenatal and postnatal periods had decreased the incidence of RhD alloimmunization from 14% to 2%[5].Next most common cause for HDNB is ABO incompatibility. Then comes minor blood group incompatibility (kelly,duffy,C,c,E,e antigen systems). Though rare these minor blood group incompatibilities can cause severe hemolytic disease postnatally[6,7]. In newborns presenting with evidence of neonatal jaundice due to hemolysis not due to Rh and ABO incompatibilities, possibility of minor blood group incompatibility should be considered. There is a necessity for introduction of antibody screening for pregnant woman as a part of antenatal care in order to reduce burden of HDNB. Developing countries with resource limited setting need to frame universal antenatal screening guidelines in order to decrease the incidence rate[8,9]. Anti-c antibodies may occur due to prior exposures such as blood transfusions, abruptio placenta, spontaneous abortion, previous cesarean section[10].In our case, mother had history of 2 Units of PRBC transfusion followed by LSCS during First pregnancy, probably when allosensitization might had occurred. HDNB due to minor blood group incompatibility may have wide clinical presentation ranging from hydrops fetalis to subclinical hemolysis[11] .Our case had active hemolysis and hyperbilirubinemia requiring phototherapy and Intravenous immunoglobulins. DCT positivity is not directly proportional to severity of disease and is usually positive only in 30% of minor group incompatibilities.

## CONCLUSION

In conclusion, paediatricians should always consider minorblood group compatibility in cases of severe haemolysiswithhyperbilirubinemia and positive DCT even if major bloodgroup incompatibility is not detected. Also, obstetriciansshould include screening for alloantibodies to minor RBCantigens in mothers. If antibodies are detected, then foetusshould be closely monitored for any signs of haemolysis andalso postnatally, anaemia and hyper bilirubinaemia should bekept in mind.

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