

## Utility of Direct Coomb's test in a Tertiary Care Nursery

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### ABSTRACT

**Objective:** To document the causes and clinical significance of direct Coomb's test distal convoluted tubule in neonatal Jaundice at a tertiary care setup.

**Study Design:** Cross-sectional study.

**Place and Duration of the Study:** Fatima Memorial Hospital, Lahore Pakistan, from Nov 2019 to Oct 2020.

**Methodology:** All babies born to "O" or Rh-negative blood group mothers were included. In addition, data including demographics, mother's blood group, baby's blood group, direct Coomb's test results, bilirubin values, and need for treatment was recorded.

**Results:** The study included 989 neonates. Of all, 489(49.4%) were male, the mean birth weight was  $2.80\pm 0.75$  kg, and the mean gestation was  $36\pm 4.3$  weeks. ABO mismatch was present in 452(45.7%) cases and Rh mismatch in 123(12.4%). Of all, 58(5.9%) had positive direct Coomb's test. Amongst the positive direct Coomb's test patients, 44(75.8%) babies needed treatment, of which 40(90.9%) received phototherapy, and 4(6.8%) needed Intensive phototherapy (360 degrees). No baby needed an exchange transfusion.

**Conclusion:** In most cases, positive direct Coomb's test was due to ABO blood group incompatibility. In addition, early phototherapy can control bilirubin rise in most cases, so few would need aggressive or intensive treatment.

**Keywords:** ABO mismatch, Direct Coomb's test, Neonatal jaundice, Rh mismatch.

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## INTRODUCTION

Jaundice, especially in the early days of life, is a common problem in neonates. Up to 60-80% of neonates worldwide develop Jaundice in the first week of life.<sup>1</sup> Locoregional statistics suggest an incidence of 50-70% amongst new-born.<sup>2</sup> It is mostly physiological, which resolves spontaneously.<sup>3</sup> However, the pathological causes need to be diagnosed and dealt with cautiously. For example, aggressive hemolysis or delay in starting phototherapy may result in high bilirubin levels leading to acute bilirubin encephalopathy and kernicterus.<sup>4,5</sup>

In case of maternal and fetal blood group mismatch, maternal antibodies, if present, against fetal RBCs cross into the foetus, either trans-placentally during pregnancy or at the time of separation of placenta.<sup>6</sup> These antibodies cause fetal/neonatal RBC's haemolysis, leading to anaemia and hyperbilirubinemia.<sup>7</sup>

*Direct Coomb's test* is a cheap and readily available screening test to detect the presence of maternal antibodies against fetal red blood cell antigens.<sup>8</sup> DCT

positivity is mostly due to ABO incompatibility. However, Rh and sub-groups (anti-E, anti-C) can also cause positive DCT.<sup>9</sup> The worldwide rate of Direct Coomb's test positivity is 1.5%. However, data in our setup is lacking.<sup>10</sup>

This study aims to document the utility of DCT in a resource-limited setting like ours for its causes and its role in detecting early neonatal Jaundice.

## METHODOLOGY

The cross-sectional study was conducted at Fatima Memorial Hospital, Lahore Pakistan from November 2019 to October 2020. The Ethical Review Committee of Fatima Memorial Hospital approved the study. The sample size was calculated using an online calculator, with the jaundice prevalence in neonates of 80%, as reported in literature.<sup>11</sup>

**Inclusion Criteria:** All neonates born to mothers having RhD negative and 'O' blood groups were included.

**Exclusion Criteria:** Neonates whose mothers were RhD positive or had any blood group other than 'O' were excluded.

Data were collected for the mother and neonates' blood type (ABO and Rh) and DCT status. In addition,

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neonatal weight, gestational age and gender were collected from nursery data. Serum total bilirubin (STB) was done for all DCT-positive babies within 1st 24 hours of life per protocol. STB values were plotted on NICE charts for the corresponding gestation. The need for treatment with phototherapy (standard and intensive) or exchange transfusion was based on plot findings.<sup>12</sup>

Evidence of hemolysis (schistocyte and reticulocyte count on peripheral smear) was subsequently checked for all babies having STB needing treatment. The schistocyte and reticulocyte counts were then compared with standards for particular gestational age groups and, if increased, showed evidence of hemolysis.<sup>13</sup>

Statistical Package for Social Sciences (SPSS) version 23.00 was used to analyse data. Categorical variables were presented as numbers and percentages. Continuous variables were presented as mean and SD values. The Independent sample t-test was used for inferential statistics and the *p*-value of  $\leq 0.05$  was considered statistically significant.

## RESULT

There were 989 participants in our study, of which 500(50.6%) were females. Birth weight ranged from 1.1 kg to 4.2 kg (mean birth weight  $2.80 \pm 0.75$ kg). At the same time, gestational age ranged from 27 weeks to 42 weeks (mean gestational age  $36 \pm 4.3$  weeks). 2/3rd (76.6%) neonates were full term (greater or equal to 37 weeks gestation), and 640(64.7%) neonates had birthweight in the 2-2.99kg range. Out of 788(79.7%) mothers with the "O" blood group, 452 (57.3%) had a baby with a blood group other than O. Of the 50(11%) of these babies who had positive DCT results, babies having "A" blood group had slightly higher DCT positivity (27 out of 204) (5.9%) than "B" blood group (23 out of 248) (5%) (Table-I). 143(14.4%) mothers were RhD negative, and 123(86%) had baby mismatches. 8(6.5%) babies had DCT positive (Table-II).

**Table-I: Association of ABO Incompatibility with Direct Coomb's Test (n=788)**

Mother Blood Group "O" (n= 788)	Neonate Blood Group	n (%) (Total 452 -% Out of 788)	DCT Positive n (%) (Total 48 -% Out of 452)
	A	204(25.9%)	27(5.9%)
	B	248(31.5%)	23(5%)
	AB	0	-
	O	336(42.6%)	-

**Table-II: Association of Rh Incompatibility with Direct Coomb's Test (n=143)**

Mother Rh D Negative (n=143)	Neonate Rh Status	n (%) (Total 143)	DCT Positive n(%) (Total-8, % of 143)
	RhD positive	123(86%)	8(6.5%)
	RhD negative	20(14%)	-

Among the neonates with positive DCT, 44 (75.6%) had a haemolytic profile and needed treatment; 4(6.8%) required intensive phototherapy. Table-III showed that with DCT positive result, the need for treatment had a sensitivity of 50.7% and specificity of 98.4%. Its positive predictive value was 75.8%, and its negative predictive value was 95.4%.

**Table-III: Association of Direct Coomb's Test with Treatment (n=989)**

DCT Status	Treatment Needed		<i>p</i> - value
	Yes	No	
Positive	44 (75.6%)	14(24.1%)	<0.001
Negative	43(4.6%)	888(95.4%)	

## DISCUSSION

Our study showed that direct Coomb's test could focus on babies at high risk of developing Jaundice with the need for monitoring and treatment. Moreover, it is a readily available blood test in most neonatal units. International literature shows good sensitivity and specificity in detecting maternal antibodies.<sup>8,13</sup> A positive result would alert the treating physician of the hemolytic profile and the possible side effects, e.g. anaemia, BIND, hydrops.<sup>14</sup> It is especially important in resource-limited settings where neonates tend to get discharged early to lessen hospital costs. Unfortunately, very limited data are available on the utility of direct Coomb's test in our setup. Our study will help establish direct Coomb's test utility in a low-resource setup.

In our unit, we perform a DCT test in all babies born to mothers having an "O" or Rh-negative blood group. Our study showed a 5.8% positive DCT result. It is closer to the reported incidence of 6.6% in a study from Turkey but higher than the reported incidence of 2.3% in Australia and 2.59% in Greece.<sup>15,16,10</sup>

In our study, ABO incompatibility has been a more frequent cause of positive DCT than Rh incompatibility (5.1% vs 0.7%). A similar discrepancy in results between ABO and Rh groups (4% vs 0.4%) by Alkhater *et al.* in Saudi Arabia in 2021.<sup>15</sup> In Iceland, 73.6% of DCT-positive had ABO incompatibility, and 20.4% had Rh incompatibility.<sup>17</sup> One of the obvious

reasons could be the higher numbers of O-blood mothers. In addition, babies can have A, B or AB blood groups for incompatibility. A higher percentage of our DCT-positive babies (44 out of 58–74.6%) needed phototherapy as compared to 23% reported by Danish *et al.*<sup>18</sup>

Transcutaneous bilirubinometry (TcBR) is increasingly used to detect bilirubin levels in neonates worldwide. However, despite being a non-invasive method, the considerations of financial costs, lack of standardisation guidelines, inaccurate value in Asian and dark-skinned people, and high false-positive results are not yet adopted in our unit.<sup>19</sup>

Therefore, despite the latest modalities, direct Coomb's test remains a cost-effective and readily accessible method of detecting neonates at risk of developing severe hyperbilirubinemia and its complications.

### LIMITATIONS OF STUDY

Our study was a single-centre study from the plains of Punjab. Therefore, we need more studies from different parts of Pakistan to support our data. Moreover, Comparative data with a transcutaneous bilirubin meter is lacking that may help us decide on one over the other.

### CONCLUSION

ABO incompatibility was the commonest cause of Positive direct Coomb's test in our study. Positive DCT predicts severe disease and aggressive therapy.

**Conflict of Interest:** None.

### Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MA & ZA: Study design, drafting the manuscript, concept, data interpretation, approval of the final version to be published.

RG & TM: Critical review, drafting the manuscript, approval of the final version to be published.

FS & SP: Data acquisition, data analysis, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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