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Research Article

### DETERMINATION OF CORRELATION BETWEEN CORD BLOOD AND VENOUS BLOOD BILIRUBIN PREDICTS NICU STAY OF NEWBORNS WITH JAUNDICE

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**Abstract:**

**Background:** In neonates, discharged after delivery at earlier postnatal ages, are likely to get admitted in nursery secondary to neonatal jaundice. This readmission is definitely a major source of burden in nursery which can be dealt with proper evaluation before discharging the neonate.

**Objective:** To determine the correlation between cord blood bilirubin and venous bilirubin on the 3<sup>rd</sup> day of life.

**Methods:** Cross sectional descriptive study was carried out on 100 healthy term neonates. Immediately after delivery, blood was collected from cord of the newborn, delivered either vaginally or cesarean section for the total serum bilirubin unconjugated serum bilirubin levels and conjugated serum bilirubin levels. On 3<sup>rd</sup> day (72 hours), second serum blood sample drawn from peripheral venous blood, measurements of total serum bilirubin, unconjugated serum bilirubin and conjugated serum bilirubin are repeated. The study conducted for 6 months from 1<sup>st</sup> May 2016 to 31<sup>st</sup> October 2016.

**Results:** Subjects were categorized into hyperbilirubinemic and non-hyperbilirubinemic newborns. The results obtained on the basis of collective and stratified samples show that there is significant correlation 0.541 and P-value 0.000 between serum cord blood bilirubin and peripheral venous sample of blood bilirubin.

**Conclusion:** There is a correlation between serum Cord blood bilirubin level and increase bilirubin levels in healthy term neonates. The rise in serum cord blood bilirubin levels are directly in correlation with rise in peripheral venous blood bilirubin at 3<sup>rd</sup> day of life.

**Keywords:** blood, newborn, bilirubin, hyperbilirubinemia, nursery, NICU

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**INTRODUCTION:**

Health is defined as a state of complete physical, mental and social well-being and not merely an absence of disease or immunity. Health is a fundamental human right. [1]

Although more than 60 years have been completed since we got independence but still there are some major health issues which are absolutely failing in getting hold of them. We are amongst the top rankings of Infant Mortality Rate compared to developed countries. Infant mortality rate (IMR) is one of the most universally accepted indicators of health status not only for infants but also the whole population. [2]

Unlike developed countries, Pakistan must have been aware of limited resources and limited infrastructure for the development of health unit for neonates specially unit for intensive care of neonates. The foremost goal should be to reach out the masses and to provide optimum care to neonates and gradually declining the ever increasing death rate of children under 1 year specially in newborn period of time.

In full term neonates, jaundice which is clinically apparent is diagnosed in 60-70% of total neonates and this percentage increases upto 80% of preterm neonates. [3] Out of these, although 6.1% of neonates delivered at full term have total serum bilirubin just above 12.9 mg%. Total serum bilirubin above than 15 mg% is found in about 3% of normal term neonates. [4]

The potentially fatal encephalopathy secondary to rise in bilirubin is a major threat in this age group as higher concentration of bilirubin crosses blood brain barrier and gets deposited in different areas of brain. Known debilitating and life limiting conditions such as cerebral palsy, sensorineural deafness and mental retardation are the sequelae of bilirubin encephalopathy. [5] Despite screening in many developed neonatal care centres, hyperbilirubinemia continues to be a major health problem. [6]

Timely diagnosis and prompt decision for the earliest possible treatment modalities like phototherapy, which is effective and does not need higher expertise and also cost effective is appropriate in treating most of the clinical cases suffering from hyperbilirubinemia. In cases with life threatening levels of high bilirubin may also be treated with blood exchange transfusion technique, which is definitely is a procedure demanding skilled medical staff, high cost of treatment intensive monitoring and potential life hazards for the neonate. [6]

Contributing factors for early discharge of healthy term neonate include, medical and family restraints, financial constraints, resulting in inadequate evaluation, limited follow ups and thus ultimately higher morbidity and mortality in neonates. [7]

To predict jaundice in neonates with serum cord bilirubin levels, surely provides immense help in diagnosing the neonates who are susceptible to develop hyperbilirubinemia in early few days of neonatal life. Mere examining the neonate physically, may result in increased likelihood of misinterpretation of serum bilirubin levels. To prevent morbidity and mortality and decreasing the undue stay of healthy neonate in nursery, early desirable prediction of high levels of jaundice and prompt management surely will reduce certainly unwanted potentially fatal bilirubin dependent injury of neonatal brain.

**MATERIAL AND METHODS:**

This study underwent at KRL Hospital, Islamabad, Pakistan. from May 2016 till October 2016. Among all babies delivered consecutively, 100 healthy neonates with gestational age of more than 37 weeks, based on last menstrual period was chosen for this study.

After taking permission from the hospital ethical committee, with the formal informed consent from the parents 2cc of blood was collected from all patients according to the inclusion and exclusion criteria from the umbilical cord vein by the labor room nursing staff, collected sample was centrifuged by the technician of lab and serum was separated to measure total bilirubin by jendressikgrof method on photometric system by the expert pathologist at KRL hospital.

All neonates in the study were followed up by pediatrician daily and were kept in the obstetric ward with their mothers until their 3<sup>rd</sup> day of life. Venous samples of all neonates in study group were taken on 3<sup>rd</sup> day of life and investigated for serum total bilirubin at KRL hospital laboratory. Patients were then discharged or admitted depending on their total serum bilirubin levels. Findings were recorded in the Performa. The analysis was carried out using the SPSS version 17.0.

Variables like gender and mode of delivery were measured as frequency and percentage whereas cord blood bilirubin and venous blood bilirubin were recorded accordingly. To test the hypothesis stated, the variables like gender and mode of delivery were

stratified in groups and Pearson correlation between the cord and venous blood bilirubin was calculated. The significance of the Pearson's correlation coefficients of the stratified variables was tested with the p-value criterion ( $< 0.05$ ) in the software package SPSS.

### RESULTS:

The analysis done in the software provided with the results explained in the following tables and

paragraphs. The sample consisted of 100 healthy term newborns none of them lost follow up and no patient was excluded from the study. All patients were followed up for first three postnatal days. The hypotheses stated in the start were analyzed with the Pearson's correlation analysis.

In the results, gender and mode of delivery were measured as frequency and percentage.

Table no. 1 shows the sample distributed into male and female patients. The table gives frequency and percentage of the male and female participants of the sample. Among 100 total participants, 45 are male neonates while 55 participants are female neonates.

**Table no. 1: Qualitative presentation of the sample according to Gender/sex**

Sex	Frequency	Percentage %
Male	45	45
Female	55	55
Total	100	100

Table no. 2 shows the sample is distributed according to the mode of delivery of patients. The table gives proportion of the vaginal and cesarean sections of the patients in study. Out of 100 total participants, 40 delivered via vaginal while 60 participants were delivered via cesarean section

**Table no. 2: Qualitative presentation of the sample according to mode of delivery**

Mode of delivery	Frequency	Percentage %
Vaginal	40	40
Cessarean	60	60
Total	100	100

The correlation between cord blood and venous blood according to hypothesis was shown according to pearson relation and P-value $<0.05$  was considered significant.

To justify the hypothesis, the Pearson's correlation coefficient was estimated in SPSS. Results of the correlation analysis are presented below;

<b>Table no. 3: Results of Correlation Analysis</b>		
<b>Cord Blood Bilirubin VS Venous Blood Bilirubin</b>	Coefficient	P-value
Pearson's Correlation	.514	.000
Spearman Correlation	.541	.000

Table no. 3 above shows the correlation between serum Cord blood bilirubin and venous blood bilirubin of overall sample. The p-value is highly

significant in this case showing a significance level of 0.00 that is significantly less than the set criterion (p-value  $< 0.05$ ).

**DISCUSSION:**

Bilirubin related encephalopathy (kernicterus) is one of the commonest causes of developing delayed child in the pediatric field and hyperbilirubinemia is one of the most common complaints for readmission of the newborns. As well as that, owing to the large population & the lack of medical facilities in many parts of our country, a large number of cases of hyperbilirubinemia go undiagnosed or underdiagnosed, which in turn lead to increased admissions & subsequent readmissions.

The need for early detection of hyperbilirubinemia in the early discharged newborns from the hospital is therefore important. This early detection allows to proceed with methods to be implemented before bilirubin reaches its critical levels. American Academy of Pediatrics has developed a normogram which provides values for evaluation of term neonates based on their hour-specific serum total bilirubin. It has been recommended that predischARGE STB of all neonates should be done & compared with the normogram to determine the risk of significant hyperbilirubinemia prior to discharge. This allows identification of high risk groups which can then be retained in the hospital, observed & treated.

In this present study, we assessed the ability of cord bilirubin level to be a tool for screening for the risk of subsequent neonatal jaundice and its showing strong positive correlation depicting that raised cord blood will ultimately result in raised venous blood in healthy term neonates. In our study, cord STB was measured in healthy, term neonates & compared with development of hyperbilirubinemia on the 3<sup>rd</sup> day of life. The risk factors of prematurity, sepsis & low birth weight were excluded from our study.

**Comparison Studies of cord blood bilirubin level and the venous blood bilirubin:**

In this study, the hypothesis states that serum cord blood bilirubin is depicting positive correlation to venous blood bilirubin levels collected at third day of life. Significant Pearson value of 0.514 and P-value 0.000 between these two parameters.

In this study, the hypothesis states that serum cord blood bilirubin is showing positive correlation with venous blood bilirubin levels. There is significant correlation between the cord blood bilirubin and venous bilirubin on the 3<sup>rd</sup> day of life and the results showed Pearson value of 0.514 and P-value 0.000 has significant correlation with each other. This study assessed the hyperbilirubinemia in the venous blood, using cord blood bilirubin. Correlation established that a rise in venous blood bilirubin with each unit

rise in cord blood. Several studies have been reported on the significant relation of serum cord blood bilirubin after birth in assessing the subsequent rise in levels of bilirubin during first 3 days of life.

Amar Taksande *et al* [8] 2005, Rudy Satrya *et al* [9] 2009 published a study in 2009 showed much similar correlation between cord blood bilirubin level (p-value 0.001) and incidence of fatal bilirubin levels in term neonates.

Rostami *et al* [10] 2005, depicted in their study to identify healthy neonates at risk for developing significant higher levels of bilirubin by measuring serum cord blood bilirubin level in 643 full term neonates. Serum bilirubin level was obtained too on 3<sup>rd</sup> day of life. They concluded that cord serum bilirubin level can be used to identify newborns with subsequent hyperbilirubinemia.

Hemmati<sup>11</sup> 2016 showed in their study significant correlation between cord blood and venous blood with p-value of <0.001 which is in accordance to this study.

Dwarampudi [12] 2015, study is also in accordance to this study.

Sun *et al*<sup>13</sup> (2007), studies signifies same results as in this study. In Sun *et al*<sup>82</sup> p-value <0.001 while in this study p-value is 0.000 which is in support of this study.

The stratified data according to the gender signifies that although coefficient for males is a bit lower as compared to females; 0.493 and 0.595 respectively. According to this study females have high venous blood bilirubin with rise in cord blood bilirubin as compared to males but even in the stratified sample the correlation between cord blood and venous blood is highly significant (p-value <0.05).

The correlation analysis done in the present study also gives the results that are aligned to those found by Satrya *et al.* (2009). The results show that there is significant correlation (p-value <0.05) between cord blood bilirubin and venous blood bilirubin in both stratified samples according to the mode of delivery.

**CONCLUSION:**

Hyperbilirubinemia is one of those commonly encountered health issues in neonatal wards.

Sex of the neonate and mode of delivery have no significant impact on levels of cord and venous blood bilirubin.

Present study signifies that infant with serum cord blood bilirubin has positive correlation with venous blood bilirubin levels at 3<sup>rd</sup> day of life, making it quite possible to identify a group of neonates at higher risk of developing fatal values of raised bilirubin requiring phototherapy already at birth. Simple knowledge of an increased risk of neonatal hyperbilirubinemia in a child could influence a decision of early discharge vs. prolonged observation

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and hence reduce number of admissions and overall mortality and morbidity.

From the present study, cord bilirubin level showing correlation with incidence of significant hyperbilirubinemia in term newborns. So this cord bilirubin estimation and its correlation could predict the development of significant hyperbilirubinemia.

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