



The Assessment of the Relationship among Bilirubin in Cord Blood and Venous Blood during the Intensive Care Unit Stay of Infants with Jaundice

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Newborn babies who are released from the hospital at a younger postnatal age are more likely to be hospitalized to the nursery due to neonatal jaundice. This readmission is undoubtedly a significant source of strain in the nurseries, but it may be addressed by adequate assessment prior dismissing the newborn. The purpose of this study was to see if there was a link among cord blood bilirubin and vein bilirubin on the third day of life.

Methods: On 120 healthy term newborns, a cross-sectional description research was conducted. Blood was drawn from the child's cord right after birth, whether vaginally or through caesarean surgery, for total serum bilirubin, unconjugated serum bilirubin levels, and conjugated serum bilirubin levels. On the third day (72 hours), a second serum blood sample is obtained from peripheral venous blood, and total serum bilirubin, unconjugated serum bilirubin, and conjugated serum bilirubin levels are measured again. The research was carried out over a one-year period, from March 2020 to February 2021.

Results: The babies were divided into two groups: those with hyperbilirubinemia and those without. The findings acquired from aggregate and stratified samples demonstrate a significant association

0.542 and P-value 0.001 among serum cord blood bilirubin and peripheral venous blood bilirubin.

Conclusion: There is a link among elevated bilirubin levels in normal infants born and serum cord blood bilirubin levels. The increase in serum cord blood bilirubin levels correlates with both the increase in peripheral venous blood bilirubin on the third day of life.

Keywords: Bilirubin; cord blood and venous blood; intensive care unit.

1. INTRODUCTION

Health is described as a full condition of physical, mental, and social well-being, not only the merely the absence of disease or immunity. Health is a basic human right.

Despite the fact that we have been independent for more than 64 years, there are still certain severe health concerns that we are unable to resolve. When compared to developed nations, we have one of the highest infant mortality rates. The child mortality rate is one of the most widely acknowledged indices of health condition, not just for babies but also for the general population [1].

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 [2].

In full term neonates, jaundice which is clinically apparent is diagnosed in 60-70% of total neonates and this percentage increases up to 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 [3].

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 sequela of bilirubin encephalopathy [5]. Despite screening in many developed neonatal care centers, hyperbilirubinemia continues to be a major health problem. 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 [4]. Contributing factors for early discharge of healthy term neonate include, medical and family restrains, financial constraints, resulting in inadequate evaluation, limited follow ups and thus ultimately higher morbidity and mortality in neonates.

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 [5].

2. METHODOLOGY

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. Structured written informed from the family members, the labor room nursing staff collected 2cc of blood from all patient populations according to the specific criteria from the umbilical cord vein, the gathered samples were then centrifuged by the lab technician, and serum was kept separate to measure the total bilirubin by redressing of method on photometric system by the specialist pathologist at KRL hospital.

All neonates in the study were followed up by pediatrician daily and were kept in the obstetrics ward with their mothers until their 3rd day of life. Venous samples of all neonates in study group were taken on 3rd 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.

3. RESULTS

The analysis done in the software provided with the results explained in the following tables and paragraphs. The sample included 100 healthy term neonates; no patients were lost to follow-up, and no patients were removed from the research. For the first three postnatal days, all patients were monitored. 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 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 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 patients in study. Out of 100 total participants, 40 delivered via vaginal while 60 participants were delivered via cesarean section.

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.

Table 3 above shows correlation among 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).

4. DISCUSSION

Bilirubin-related encephalopathy (kernicterus) is one of the most prevalent causes of impaired infant development in the pediatric profession, and hyperbilirubinemia is one of the most common reasons for newborn readmission.

Table 1. Qualitative presentation of the sample according to Gender/sex

Sex	Incidence	Fraction %
Male	47	43
Female	59	51
Total	100	100

Table 2. Qualitative presentation of the sample according to mode of delivery

Mode of delivery	Incidence	Percentage %
Vaginal	40	40
Cesarean Section	60	60
Total	100	100

Table 3. Outcomes of correlation analysis

Cord Blood Bilirubin VS Venous Blood Bilirubin	Coefficient	P-value
Pearson's Correlation	.514	.000
Spearman Correlation	.541	.000

Furthermore, due to our country's enormous population and lack of medical facilities in many areas, a substantial proportion of instances of hyperbilirubinemia go undetected or underdiagnosed, resulting in higher hospitalizations and recurrent readmissions.

As a result, early diagnosis of hyperbilirubinemia in babies released from the hospital is critical. This early detection allows to proceed with methods to be implemented before bilirubin reaches its critical levels. American Academy of Pediatrics has developed a nomogram which provides values for evaluation of term neonates based on their hour-specific serum total bilirubin [6]. It has been recommended that predischarge STB of all neonates should be done & compared with the nomogram 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.

We investigated the capacity of cord bilirubin level to be a tool for screening for the risk of later newborn jaundice in this research, and it showed a significant positive association indicating that elevated cord blood will eventually result in raised venous blood in healthy newborn infants [7]. Cord STB was assessed in healthy, term newborns and related to the formation of hyperbilirubinemia on the third day of life in our investigation.

Our investigation removed the risk factors of preterm, sepsis, and low birth weight. 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. Between these two factors, there is a significant Pearson value of 0.516 and a P-value of 0.001. 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 3rd day of life and the results showed Pearson value of 0.514 and P-value 0.000 has significant correlation with each other [8]. 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 Tsakane et al. [8] 2005, Rudy Satria 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 3rd day of life. They concluded that cord serum bilirubin level can be used to identify newborns with subsequent hyperbilirubinemia [9].

Hekmati 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. Dharmapuri 2015, study is also in accordance to this study.

Sun et al. (2007), studies signify same results as in this study. In Sun et al.²² 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 Satria 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 [10].

5. 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. The current study indicates that infants to serum cord blood bilirubin have a positive correlation with venous blood bilirubin levels on the third day of life, identifying the specific a group of newborns at increased risk of developing fatal values of raised bilirubin that require phototherapy from birth. Simple information of a child's elevated risk of newborn

hyperbilirubinemia might impact a decision between early release and delayed surveillance, reducing the number of hospitalizations as well as total premature deaths. The current investigation found a link between cord bilirubin levels and the occurrence of severe hyperbilirubinemia in term babies. So, this cord bilirubin estimation and its correlation could predict the development of significant hyperbilirubinemia.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

After gaining approval from the hospital ethics review committee the study was conducted.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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