Correlation Between Transcutaneous and Serum Bilirubin in Healthy Neonates with Jaundice

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Abstract

Background: Neonatal hyperbilirubinemia poses major concern. Total serum bilirubin (TSB) measurement is invasive method. Transcutaneous bilirubin(TcB) screening is an attractive modality as it is quick, non-invasive test to screen for hyperbilirubinemia.

Objective: To determine the correlation between transcutaneous and serum bilirubin measurements in healthy neonates with jaundice.

Methods: This cross-sectional study was conducted in the Department of Pediatrics, King Edward Medical University, Lahore from July to December 2018. Total of 95 neonates of clinically suspected jaundice, aged from 24 hours upto 28 days of either gender, gestational age 36-40 weeks and birth weight ≥ 2000 grams were included by non-probability consecutive sampling. Each baby was subjected to serum bilirubin measurements. Three measurements were taken via the transcutaneous bilirubinometer, taking the average value to be used for analysis. Newborn was labeled as having jaundice when bilirubin was >5mg/dl. Data were analyzed through SPSS version 22. Pearson's correlation analysis was performed to estimate coefficient of correlation between transcutaneous and serum bilirubin measurements.

Results: A total of 95 neonates with jaundice were enrolled. Correlation between TcB and TSB measurements was 0.885 (p value <0.01). There was also positive correlation between TcB and TSB measurements for age-at-admission [r=0.803 for < 7 days, r= 0.961 for 7-21 days (p value < 0.01)], gender [r=0.903 for males, r=0.804 for females, (p value <0.01)], gestational age [r=0.926 for <37 weeks gestation, r= 0.845 for 37-40 weeks (p value <0.01)], and birth weight [r=0.933 for birth weight <2500 grams, r= 0.806 for birth weight 2500-3500 grams (p value <0.01)].

Conclusion: There was strong positive correlation between transcutaneous and serum bilirubin measurements in healthy neonates.

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Introduction

Neonatal hyperbilirubinemia is cause of concern for parents and pediatricians. It can be clinically detected during first week of life. The precise measurement of serum bilirubin is important for early identification of hyperbilirubinemia so that potential brain damage may be prevented.

Currently, three methods for measurements of bilirubin are available - serum bilirubin measurement using various chemical reactions, non-invasive transcutaneous method, and capillary method using a spectrophotometer. Total serum bilirubin (TSB), although gold standard, is invasive method. Transcutaneous bilirubin (TcB) screening is an attractive modality because it is quick, non-invasive test to screen for hyperbilirubinemia. Begum et al reported high sensitivity of TcB at different levels. Similarly, Simsek et al have found positive correlation between these two measurements. Reports from various parts of the globe are there about the variable accuracy of TcB according to the skin color of the babies. Authors in past have also found that TcB tend to under-read in light skin tone babies and over-read in darker skin tone babies. Varughese et al observed better correlation of TcB in light skin tone babies. However the results remain largely conflicting.

Limited data is available in our local areas regarding correlation between TcB and TSB measurements in neonates. The present study was conducted at our tertiary centre with the objective to establish the correlation between TcB and TSB measurements in healthy neonates admitted with jaundice in our set-up.

Methods

This cross-sectional study was conducted in the neonatal unit of department of Pediatrics, King Edward Medical University/ Mayo Hospital, Lahore from July to December 2018. The study was approved by the institutional review board of King Edward Medical University, Lahore. Informed consent was taken from patient’s parents/guardian. Total of 95 neonates of clinically suspected jaundice (calculated at 95% confidence interval and taking expected percentage of jaundiced neonates as 60%), aged from 24 hours up to 28 days of either gender, gestational age 36-40 weeks and birth weight > 2000 grams were included by non-probability consecutive sampling. Clinically, jaundice was suspected by any one of scleral icterus or yellow skin in daylight. Neonates with evidence of sepsis (total leukocyte count >25000/mm³), hemolysis, direct hyperbilirubinemia, major congenital anomaly, hemangioma or ecchymosis on the forehead, sternum or abdomen, were excluded from study. Relevant history of the babies was taken and examination was performed. Then 1cc non-heparinized blood was drawn for determination of serum bilirubin by laboratory method. Simultaneous to blood sampling, three readings via the transcutaneous bilirubinometer were taken (each at the baby’s sternum, forehead and abdomen) determining the average value to be used for analysis. We used biliCheck Bilirubinometer (Drager JM-105), which is noninvasive, transcutaneous bilirubinometer, using light instead of a needle, allows to measure bilirubin level. SPSS version 22 was used to analyze the data. Quantitative variables were expressed using mean and standard deviation. Pearson’s correlation analysis was performed to estimate coefficient of correlation between TcB and TSB.

Results

Out of 95 neonates, 62 (65.3%) were male and 33(34.7%) patients were female. The mean age at admission was 6.41±4.26 days, while mean gestational age was 37.99±1.22 weeks. Mean weight of neonates was 2645.26±549.81 grams. Mean serum bilirubin was 12.595±4.507 mg/dl, while mean TcB was 12.828±3.950 mg/dl. Correlation between TcB and TSB measurements was 0.885 (p value < 0.01) (Figure 1). There was also positive correlation between TcB and TSB measurements for age-at-admission [r=0.803 for < 7 days, r = 0.961 for 7-21 days (p value <0.01)], gender [r=0.903 for males, r =0.804 for females, (p value <0.01)], gestational age [r=0.926 for <37 weeks gestation, r= 0.845 for 37-40 weeks (p value <0.01)], and birth weight [r=0.933 for birth weight <2500grams, r = 0.806 for birth weight 2500-3500 grams (p value <0.01)] (Table I)
Here, there is a table with data on the correlation between transcutaneous and serum bilirubin measurements in different strata. The table includes columns for age, gender, gestational age, birth weight, and the corresponding number of observations, Pearson correlation, and p-value. The discussion section talks about the correlation between TcB and TSB measurements, highlighting the importance of accurate bilirubin measurements in neonates. It mentions studies by Hemmati et al. and others, including Neocleous et al. from Greece, highlighting the need for reliable screening tools for hyperbilirubinemia.

The conclusion section summarizes the findings, emphasizing the importance of TcB and TSB measurements in healthy neonates. It also includes an ethical approval and funding source section, stating that the authors declare no conflict of interest and that funding is not required.
References


