

# The study on clinical value of the detection about serum and Unconjugated Bilirubin in diagnosis of neonatal jaundice

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**Abstract:** In this paper, the clinical value of the detection about serum and unconjugated bilirubin (UCB) in neonatal jaundice was studied to find an effective and rapid method for diagnosis of neonatal jaundice. ALB (Serum Albumin), total serum bilirubin (TSB) and UCB were detected by ELISA method among the 100 cases with neonatal jaundice selected for the study. The values of ALB, UCB and TSB in moderate jaundice patients were  $(42.83 \pm 3.87)$  g/L,  $(287.35 \pm 44.38)$   $\mu\text{m/L}$ ,  $(304.16 \pm 43.40)$   $\mu\text{m/L}$ , respectively; as for the severe jaundice patients, the values were  $(38.41 \pm 4.82)$  g/L,  $(354.38 \pm 48.75)$   $\mu\text{m/L}$ ,  $(375.20 \pm 47.51)$   $\mu\text{m/L}$ . The results showed significant differences with the  $p < 0.05$  between moderate and severe jaundice patients. The level of ALB, UCB, TSB in hemolytic jaundice, obstructive jaundice and jaundice caused by other infections also had significant differences, and the difference was statistically significant ( $p < 0.05$ ). The detection of ALB and UCB provides a useful method for the diagnosis and assessment of neonatal jaundice.

**Keyword:** Neonatal jaundice; ALB; unconjugated bilirubin.

## INTRODUCTION

Neonatal jaundice is a unique disease of newborn infant with the main characteristics that yellowing of the skin, sticky membranes, sclera and other tissues of a newborn infant (Testoni, *et al.* 2015; Uhrikova, *et al.* 2015). Generally, it can be basically divided into two categories based on the clinical manifestations: physiological jaundice, which would subside in the short term after birth; pathologic jaundice, the neonatal jaundice of infant aggravated with time and could not be subsided (Uchida, *et al.* 2015). Moreover, serious pathological jaundice could cause kernicterus which affect the development of wisdom and neurological of newborn infant in post-neonatal period (Dani, *et al.* 2015). So, it was of great importance to develop a rapid method for the early diagnose of neonatal jaundice. In this study, the level of serum and unconjugated bilirubin in neonatal jaundice were detected to study the clinical value of the detection of the main indicators for the diagnosis of neonatal jaundice. The results provide a useful method for the rapid and effective detection of Neonatal jaundice.

## MATERIAL AND METHOD

### Materials

A total of 100 cases with neonatal jaundice newborn infants were admitted to the hospital from July to September in 2014 were selected. It excluded the infants with intracranial hemorrhage, repeatedly low blood sugar, hypoxic ischemic encephalopathy, central nervous system infections and congenital anomalies diseases. Infants enrolled in this study were as follow: male (57 cases),

female (43 cases), gestational weeks (35.1-42.1 weeks) average gestational week  $(37.59 \pm 1.31)$  weeks. natural delivery (66 cases), caesarean birth (34 cases), full-term infants (86 cases), premature infants (14 cases). All of the infants were born at 1 to 7 days, with an average of  $(3.83 \pm 0.83)$  days. According to the severity of jaundice, there were 72 cases of severe jaundice and 28 cases of moderate jaundice; According to the cause of disease, the classifications were listed below: hemolytic jaundice (42 cases), infectious jaundice (27 cases) and others (31 cases).

### Methods

The 4mL venous blood of fasting jaundice infants was collected in the sterile vacuum tube containing the EDTA anticoagulant. The samples were centrifuged at room temperature and serum was transformed to another tubes. The collected serum was stored at negative 20 until analysis. Vanadium acid salt method was used to detect the serum albumin, serum total bilirubin, unconjugated bilirubin and total bilirubin; Bromocresol green method was used to detect the albumin; The automatic biochemical analyzer was Olympusau-2700; The detection kit was supplied by shanghaiichen biological technology Co., Ltd. All the operations and tests were in strictly accordance with the requirements of the detection kit. And the QC was also consistent with the requirements.

## STATISTICAL ANALYSIS

All data were assessed by SPSS 17.0 program. Linear correlation between the factors and the course was analyzed with t test and F test. Data were given as mean  $\pm$ SD. Differences were considered to be statistically significant at  $P < 0.05$ .

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**Table 1:** The values of ALB, UCB, TSB for moderate and severe jaundice patients

Degree of neonatal jaundice	Cases	ALB (g/L)	UCB (µm/L)	TSB (µm/L)
Moderate	72	42.83±3.87	287.35±44.38	304.16±43.40
Severity	28	38.41±4.82	354.38±48.75	375.20±47.51
T		4.78	6.60	7.16
P		<0.05	<0.05	<0.05

**Table 2:** The values of ALB, UCB and TSB for jaundice caused by different etiology

Different etiology of neonatal jaundice	Cases	ALB (g/L)	UCB (µm/L)	TSB (µm/L)
Hemolytic jaundice	42	37.80±3.90	350.24±45.69	371.12±44.42
Infectious jaundice	27	32.16±4.13	364.64±53.33	383.34±46.57
Others	31	40.15±4.58	327.31±40.62	346.36±38.58
F		4.65	6.79	7.31
P		<0.05	<0.05	<0.05

## RESULTS

### *The detective indexes of different severity of neonatal jaundice*

In table 1, the levels of ALB, UCB and TSB were (42.83 ±3.87) g/L, (287.35±44.38) µm/L, (304.16±43.40) µm/L respectively for the moderate jaundice patients, while for the severe jaundice patients, the data were (38.41±4.82) g/L, (354.38±48.75) µm/L, (375.20±47.51) µm/L. ALB of moderate is higher than ALB of severity with 4.42 g/L. UCB and TSB of moderate is lower than THAT of severity with 73.07µm/L and 71.04µm/L. The values of detective indexes for moderate jaundice patients were significantly different to the severe jaundice patients tested (p<0.05).

### *The detective indexes of neonatal jaundice caused by different etiology*

Table 2 listed the levels of ALB, UCB and TSB respectively for hemolytic jaundice, infectious jaundice, obstructive jaundice and jaundice caused by other etiologies. The cases of hemolytic jaundice, infectious jaundice, and others were 42, 27 and 31. The levels of ALB, UCB and TSB in hemolytic jaundice were (37.80±3.90) g/L, (350.24±45.69) µm/L, (371.12±44.42) µm/L. The levels of ALB, UCB and TSB in infectious jaundice were (32.16±4.13) g/L, (364.64±53.33) µm/L, (383.34±46.57) µm/L. The levels of ALB, UCB and TSB in other were (40.15±4.58) g/L, (327.31±40.62) µm/L, (346.36±38.58) µm/L. ALB in others is highest, while UCB and TSB in others is lowest. The data of every group was significantly different to other group tested.

## DISCUSSION

Neonatal jaundice is a very common condition that could occur in 60% of newborns during the first two weeks of life (Peng *et al.* 2015). Most jaundice would mitigate with the time going on, but a small number of newborns would suffer from serious jaundice or recurring after several

weeks (Nasrin *et al.* 2014). It is commonly due to an increase in unconjugated bilirubin and resolves spontaneously (Eroglu, *et al.* 2015). Infants who have severity hyperbilirubinemia would probably have brain nerve injury, hearing impairment, Mental abnormalities and other sequelae caused by the crossing of high bilirubin through the blood brain barrier (Amin and Lamola, 2011). Therefore, it is important that the diagnosis of hyperbilirubinemia be well-timed to prevent the worsening of the patient's outcome due to a delayed diagnosis and ease nuclear jaundice.

UCB, conjugated bilirubin (CB), free bilirubin and delta bilirubin were the main forms of bilirubin in blood serum (Wen, *et al.* 2013). In serum, UCB was the most significant form while the concentration of free bilirubin and delta bilirubin was comparatively lower (Costantino, *et al.* 2014). In clinics, TSB detection is easy to carry out, but the study found that the detection of TSB was not sufficiently sensitive and specific to predict whether the infants had neonatal jaundice. Moreover, the newborn infants may not have the nuclear jaundice despite of the high levels of TSB (Dani, *et al.* 2015). Free bilirubin was supposed to be a sensitive indicator for assessing the toxicity of bilirubin with the reason that it was easy to connect with the brain cells when it crossed the blood brain barrier, which would cause the brain damage (Okwundu, *et al.* 2013). However, it was unable to be a common method for detecting neonatal jaundice, as the detection of free bilirubin was too difficult to be carried out in large scale in clinics. Theoretically, the concentration of UCB was closely related to the level of free bilirubin and the free bilirubin increased with the increasing of UCB. It was believed that the detection of UCB was a good indicator for the responding toxicity of bilirubin to nerve cells. UCB and albumin were reversible in serum, the level of serum bilirubin was closely related to the change of albumin (Boo, *et al.* 2011). The rise of bilirubin was due to the lack of binding force, reduction of albumin was a common indicator for the occurrence of

jaundice (Fujiwara *et al.* 2010). In this study, the variation of ALB and UCB were detected in different degrees of neonatal jaundice and also the neonatal jaundice caused by different etiology. The results revealed the level of ALB decreased and UCB increased along with the aggravation of jaundice, which demonstrated that the detection of ALB and USB was significant for the diagnosis and assessing of neonatal jaundice. Infection, hemolysis and bile duct obstruction were the main causes of neonatal jaundice and the level of ALB. UCB was different in infants with jaundice caused by different etiology. There were study reported that the increase of USB was more apparent in jaundice caused by infection than other factors such as hemolysis *et al.* The refor, the variation of USB in infants with jaundice was also contributed to the analysis of the etiology. In this paper, the concentrations of ALB and UCB were measured in infants who had jaundice caused by different pathogeneses. The results were in according to the previous report that the level of ALB and UCB in newborn jaundice varied with the variation of etiologies caused jaundice.

In conclusion, the detection of USB and ALB provided a useful tool for assessing the severity of the jaundice disease and presented a promising guideline for diagnose and treatment of the newborn jaundice.

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