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Measurement of Bilirubin Level in Newborns

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Abstract **Original Research Article**

Background: Neonatal jaundice is a clinical sign of neonatal hyperbilirubinemia, or high total serum bilirubin (TSB), which is caused by bilirubin deposited into an infant's skin. Sclerae, mucous membranes, and yellowish skin are the hallmarks of neonatal jaundice.

Methods: This study included 50 patients and 15 healthy groups. Every patient chosen for this study had TSB (blood samples were taken as part of the standard clinical procedure).

Results: These results show that significant difference ($p<0.05$) higher among the age group between 6-10 days. These results show that no significant difference of the gender were statistically no significant ($p>0.05$) patients as contrasted with the control groups. These results demonstrate that significant difference in BMI between patient and control group ($p<0.05$). In comparison to those without jaundice, the majority of newborns with jaundice were underweight at birth. These results show that significant difference in TSB patient and control group.

Conclusions: The present study suggested that BMI and bilirubin substantially significant ($p<0.05$) correlation with the risk of neonatal jaundice patients as compared with control group.

Keywords: neonatal jaundice, Body mass index, bilirubin.

Introduction

Hyperbilirubinemia, is has a yellowish hue to the skin, mucous membranes, and sclera and is brought on by elevated total serum bilirubin produced by a high level of total serum bilirubin and is characterized by yellowish skin, sclera, and mucous membranes (Gale *et al*., 2019).

When an infant is born at full term, their total serum bilirubin (TSB) level typically rises to a peak of 6 to 8 mg/dL by 3 days of age, after which it declines. An increase to 12 mg/dL is within the range of physiology. Early babies may have a peak of 10–12 mg/dL on the fifth day of life, with the possibility of exceeding 15 mg/dL without any particular bilirubin metabolism anomalies. In both full-term and preterm newborns, levels below 2 mg/dL might not be detected both full-term and preterm infants, until they are one month old, preterm babies' safe bilirubin levels vary depending on their gestational age (Cashore, 2018).

Conjugated hyperbilirubinemia (CHB), however, is always pathogenic and shows a surgical or medical

etiology at play, can occur in certain infants with jaundice, most neonates with clinical jaundice have UHB. The causes of pathological CHB and UHB are numerous and diverse. According to Soares *et al*. (2014), infants born prematurely or with congenital enzyme impairments are especially vulnerable to the negative unconjugated bilirubin's impact on the central nervous system (Soares *et al*., 2014)

The Production of Bilirubin Increases ABO and Rhesus incompatibilities are examples of blood type incompatibilities that are included in immune-mediated hemolysis. Red blood cell membrane abnormalities such as hereditary spherocytosis and elliptocytosis, Red blood cell enzyme abnormalities such as (G6PD) deficiency and pyruvate kinase deficiency, sequestration such as cephalohematoma, sub galeal hemorrhage, and intracranial hemorrhage, polycythemia, and sepsis are examples of non-immune mediated hemolysis (Alenezi *et al*., 2018).

Acute and chronic bilirubin encephalopathy may result from severe hyperbilirubinemia, which can also develop bilirubin-induced neurological dysfunction (BIND) if left untreated. The two main pillars of UHB are phototherapy and exchange transfusions treatment, however intravenous immunoglobulin (IVIG) also works for some patients. The etiology is the primary determinant of the more complicated treatment of CHB. Even with improvements in treatment and care, hyperbilirubinemia continues to be a major cause of morbidity and death (Chinsky *et al*., 2017).

Materials and Methods

Sampling of Cases

a) 50 patients were included in the trial group. The chemistry department of Al Zahra Teaching Hospital is where these samples were gathered. Every patient chosen for this study had TSB (blood samples were taken as part of the standard clinical procedure). Patient demographic data, such as age and gender, was gathered from hospital patient data sheets.

b) Healthy group: It contains of 15 healthy subjects; all were without any inflammatory disorders or clinical manifestation of any disease.

Biochemical Tests

Bilirubin test were done by using kits, which are products of BIOLABO REAGENT (Maizy, France).

Procedure

a. Modification of the instrument's wavelength to 555 nm.

b. Distilled water can be used to adjustment the instrument to zero.

Pipetted working solutions into a cuvette *working reagent 1.5 ml reagent T+100µl sample (Blank calibration). ** Sample 100 µl+1.5ml reagent T, and 50µl reagent N (Specimen test) (Puttaraju *et al*., 2007).

The content of each tube was mixed, incubation 5 min at room temperature.

c. The absorbance was measured (Abs) of sample against blank.

Calculation

Bilirubin cone, (mg/dl) was calculated by using the following equation: (Abs)of Sample -Abs of blank) x factor = Bilirubin mg/dl.

Statistical analysis

Using the Statistical program for the Social Sciences (SPSS) version 23 software statistical program, the findings were statistically analyzed. The t-test and chi-square test (with P value at level of significance less than 0.05) were used to contrast the results between various groups. Either percentages, mean ± SE, or the number of patients were used to express the results.

Results and Discussion

Demographic Characteristics of Patients

1. Gender

The clinical assessment revealed that the frequency of distribution of patients according to gender were

25(50%) females and 25 (50%) males (Figure 1). The gender disparities were not statistically significant (p>0.05). The Controls were matched for gender, and showed a similar distribution pattern.

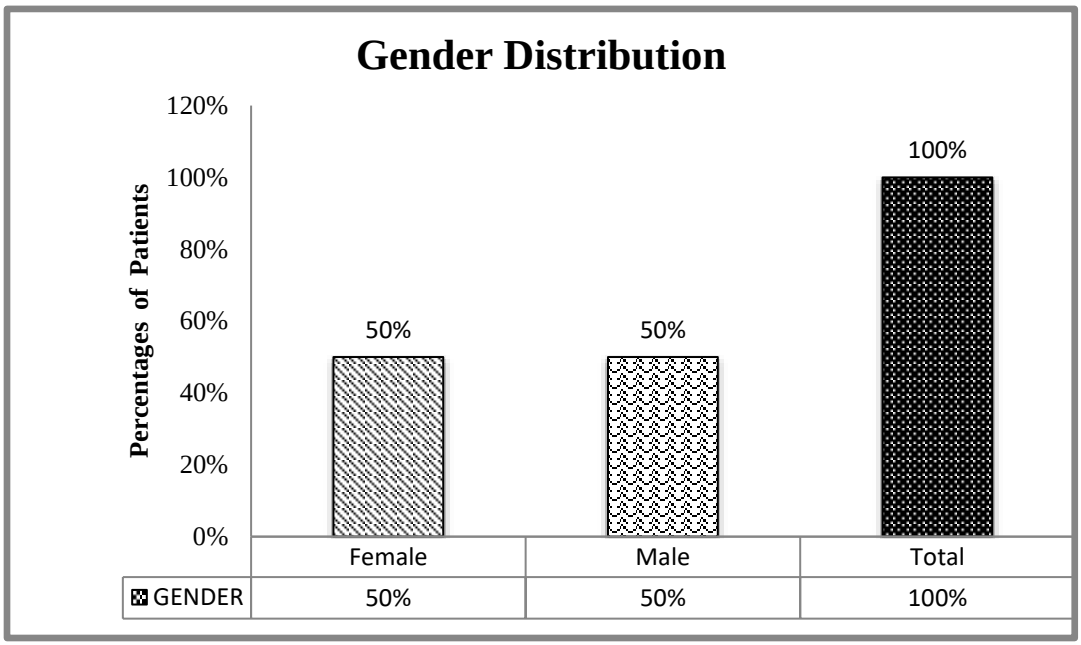

Figure 1: The frequency with which patients are distributed by gender**.**

These results showed that no difference between males and females with neonatal jaundice (though not statistically significant) should be interpreted with caution; it will be difficult to draw such a conclusion in this study owing to the smaller number of participants which collected randomly.

Present results were difference with Bala *et al*. (2015) results which found that males more from females.

Present results were difference with Alnujaidi *et al*. (2021) results which found that males more from females.

2. Age

The evaluation of the patients' age at diagnosis showed that 12 (24%) in age group 1-5 days, 26(52%) in age group 6-10 days, 6 (12%) in age group 11-15 days, 6(12%) in age group 16-20 days (Figure 2) Their ages ranged from 1 to 20 days, with a mean age of 9.28 days. There were statistically significant age group differences (p<0.05).

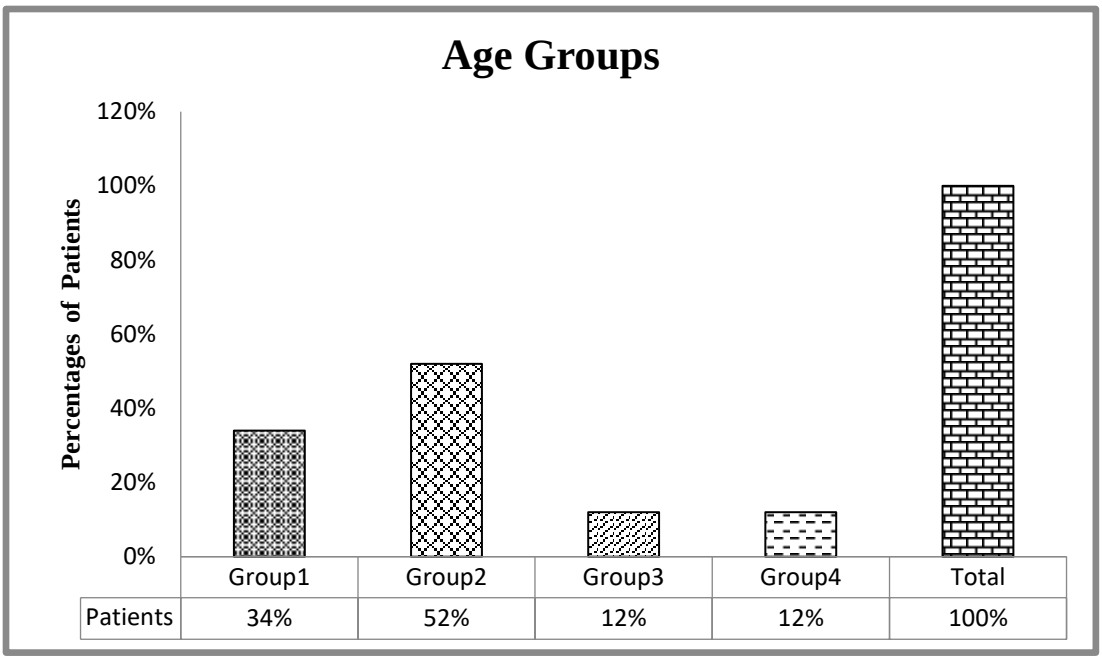

Figure 2: Age distribution of patients presented with neonatal jaundice. (Group1: 1-5, Group2: 6-10; Group3: 11-15; Group4: 16-20 days).

The approximate frequency of neonatal jaundice grew in the second age group 6-10 days, with statistically significant age group differences ($p< 0.05$) between groups.

These results show that aged 6-10 years were more often likely to have neonatal jaundice may be due the preterm neonates, defined as those born before 37 weeks of gestation, are more likely than full-term neonates to experience severe jaundice, with or without bilirubin-induced neurotoxicity. The hepatic immaturity, elevated bilirubin synthesis, elevated bilirubin enterohepatic circulation as a result of delayed enteral feeding, and immature gut make up this. Compared to full-term babies, late-preterm infants (34–36 weeks) and early-term infants (38 weeks) are more likely to experience severe (Watchko, 2016).

These results also agreed with study Cayabyab & Ramanathan. (2019) that document the neonatal jaundice were registered in young a risk is increased for preterm newborns, or those born before 37 weeks of pregnancy.

3. BMI (Body mass index)

Parameters	Control (n=15)	Patients (n=50)	P value
BMI (Kg)	3.353 ± 0.430	3.037 ± 0.786	0.074*

Table 1: BMI distribution of patients presented with neonatal jaundice.

These results show that significant difference in BMI between patient and control group ($p<0.05$). In comparison to those without jaundice, the majority of newborns with jaundice were underweight at birth.

These results agreed with study Adoba *et al.* (2018). It found a correlation between low newborn birth weight and jaundice in India. The logistic regression's conclusion that neonates with low birth weights are more likely to experience newborn jaundice supports this even further.

These results agreed with study Odabasi & Bulbul. (2020). which recorded that weight lack as risk factors for severe jaundice.

Biochemical test

1. Bilirubin

Parameters	Control (n=15)	Patients (n=50)	*P* value
TSB (mg/dl)	4.800 ± 1.761	11.940 ± 3.341	<0.0001*

Table 2: TSB distribution of patients presented with neonatal jaundice.

These results show that significant difference in TSB patient and control group.

This study agreed with Najib *et al*. (2013) which recorded that

Increased hemoglobin produced from the breakdown of (RBCs) as a result of the shorter lifespan of RBCs in neonates can result in elevated bilirubin levels in these patients. The decrease in bilirubin hepatic metabolism brought on by immaturation.

This study agreed with Boskabadi *et al.* (2020) which recorded that

More than half (61.25%) of the newborns had an unknown cause for their jaundice, whereas 22% of the causes were related to increased bilirubin production and 7% were related to severe weight loss. Developing brain damage or bilirubin encephalopathy can result from elevated bilirubin levels.

The study by Scrafford *et al*. (2013) which recorded the majority of moms with jaundiced newborns had longer labor durations than the controls, indicating a correlation between labor duration and neonatal jaundice. The clinical association between a longer labor time and cephalohematoma, a recognized risk factor for severe hyperbilirubinemia, is most likely the cause of this. Our study's observation that moms who experienced protracted labor had a higher likelihood of their newborns having jaundice lends further credence to this conclusion.

Conclusions

In light of the data and outcomes, the research has made the following conclusions.

Conclusions:

- The prevalence rate of neonatal jaundice is significantly ($p<0.05$) higher among the age group between 6-10 days.

- The differences of gender were statistically no significant ($p>0.05$) patients as compared with control group.
- Significant increases ($p<0.05$) were found in BMI and bilirubin patients as compared with control group.

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