



STUDY THE PHYSIOLOGICAL JAUNDICE IN NEWBORN BABIES (NEONATAL JAUNDICE) AND ITS RELATIONSHIP WITH BLOOD PARAMETER (HEMATOCRIT) IN WAIST PROVINCE/IRAQ

Zahraa Alwan Jasim

Department of Biology/ College of Science / Wasit University / Iraq.

Corresponding authors email: zahraa_alwan@yahoo.com

ABSTRACT

The present study was conducted on Physiologic jaundice and evaluate the level of total serum bilirubin (T.S.B) and its relationship with the blood parameters hematocrit (HCT) in newborn of Wasit Province/Iraq from the period 1/7/2016 - 1/10/2016. (100) healthy newborns ages from (3 – 20) day in both sex gender were included in the study, all babies were divided in to three groups according to their level of T.S.B that have been measure, group A have (T.S.B < 5 mg/dl), group B (5 < T.S.B < 10mg/dl) and group C (T.S.B > 10 mg/dl). Blood tests were carried out in the laboratory to measure the levels total serum bilirubin (T.S.B) and the levels of hematocrit (HCT). We compared mean value of TSB for group A with mean value of TSB for group C, also compared mean value of HCT for group A with mean value of HCT for group C, group B was eliminated from comparison because it have nearly value that in others groups. For detect if there is relationship between increased or decreased total serum bilirubin values with the increased or decreased hematocrit value in newborns. We conclude from the study that Physiologic jaundice is a state of nature occurring for newborn infants and has a strong relationship with blood cells, as the proportion of high red blood cells in children is the main cause of high bilirubin level and thus the incidence of neonatal jaundice in newborns. The results showed that there was a positive relationship between the levels of HCT and T.S.B, it was calculated that the level of HCT is high accompanied by an increase in the level of TSB and decrease the level of HCT low levels of T.S.B. Also, the results showed that the average value of bilirubin and the average hematocrit was within the normal range for newborn of Physiologic neonatal jaundice.

KEY WORDS: Physiological jaundice, Neonatal jaundice, Polycythemia.

INTRODUCTION

Physiologic jaundice is a common type of jaundice occurs during the first week of life all newborn it is not an indication of an underlying disease, generally its harmless but if still more than month of baby age may become pathogen (CPS, 2007 and NICE, 2010). Jaundice caused by the accumulation of bilirubin that would be deposited in the skin, the whites of the eyes, and other tissues (CPS, 2007 and Muchowski, 2014). Although most newborns with jaundice are otherwise healthy, they need to be deposited in the skin, the whites of the eyes, and other tissues (CPS, 2007 and Muchowski, 2014). Although most newborns with jaundice are otherwise healthy, they need to be monitored because bilirubin is potentially toxic to the central nervous system (Maisels and Newman, 1995; Bhutani *et al.*, 2004). The average total serum bilirubin level usually at 5 to 6mg / dL (86 to 103µmol per L) on the third to fourth day of life and then declines over the first week after birth (NICE CKS, 2015; Behrman *et al.*, 2000). Bilirubin elevations of up to 12 mg/dL, with less than 2 mg per dL (34 µmol per L) of the conjugated form, can sometimes occur. Infants with multiple risk factors for development jaundice to harmful include (parents have diabetes, low weight, breast-fed babies, male infants, east Asians and glucose-6-phosphate dehy-drogenase deficiency) (Muchowski, 2014; Behrman *et al.*, 2000; Ullah *et al.*, 2016; Dennery *et al.*, 2001; Clemons, 2000 and NICE, 2016). Develop an exaggerated form of physio

logic jaundice in which the total serum bilirubin level may rise as high as 17 mg per dL (291 µmol per L) (Dennery *et al.*, 2001). Level of bilirubin increased after birth for many reasons and the main reason is break down of red blood cells as well as the immature liver function, bilirubin production typically declines to the adult level within 10 to 14 days after birth (Behrman *et al.*, 2000; Meredith *et al.*, 2002; ACT, 2012 and Gautam, 2016). Newborns normally have a high red blood cells count at birth and their red blood cells have a shorter life span than adult red blood cells ,therefor red blood cells undergo normal daily breakdown of aging red blood cells a process called hemolysis Altman and Dittmer,1961; Arthur and Kopelman, 2016; Marks and Glader, 2009 and Jeffery *et al.*, 2009), because of replaced hemoglobin fetus by hemoglobin adult that was occurred after delivery the breakdown of hemoglobin fetus to replace by adult hemoglobin Functionally, fetal hemoglobin differs most from adult hemoglobin in that it is able to bind oxygen with greater affinity than the adult form , giving the developing fetus better access to oxygen from the mother's bloodstream (Berg *et al.*, 2002; Rodgers *et al.*, 1993).

Within the first week after delivery, hemoglobin and hematocrit values begin to decrease in response to the higher ambient oxygen concentration ex utero, it is postulated that this increase in oxygen concentration, combined with a rising percentage of adult hemoglobin, until its reached normal value for children (Erica and

Jacqueline, 2007). Bilirubin is the final product of heme degradation. (At physiologic pH, bilirubin is insoluble in plasma and requires protein binding with albumin after conjugation in the liver, it is excreted in bile, also the affinity for bilirubin is lower in newborn than in the older infant. Adult levels of affinity are not reached until as late as five month of age (Dennery *et al.*, 2001; Gautam, 2016; Melton and Akinbi, 1999; Wintrobe and Lee, 1999; Gartner and Herschel, 2001).

Many of researchers consider the peak serum bilirubin level >15 mg/dl as a hyperbilirubinemia since specific treatment is usually considerate or above this level (Riskin *et al.*, 2003; Maisels, 1981). Total serum bilirubin (T.S.B) value in the physiological jaundice should be between (5-15) mg/dl for healthy newborn and that will decline to under 5 mg/dl after 2-3 week of age babies leading to disappear of physiological jaundice, also normal hematocrit for them had been value of 61% and hemoglobin (Hb) 18 g/dl and with 1-3 day of age babies and that will be declines to (17 -16) g/dl with 1-2 weeks until reach to 11 g/dl with 6 months of age (Behrman *et al.*, 2000; Jeffery *et al.* 2009; Erica and Jacqueline, 2007 and Amar *et al.*, 2016). In our present study the mean value for TSB was 7.7 mg/dl with 1-3 weeks of age babies, and the HCT was 51.8% these parameters were had a normal concentration, also we found there was positive relation between these parameters TSB and HCT, for all babies, when HCT was high, TSB was high too and they low down together. This relation between it's due to relative polycythemia and increased red blood cell turnover in neonates (Gartner and Herschel, 2001).

MATERIALS & METHODS

The newborns in this study were divided into three groups according to their level of total serum bilirubin, group A have (T.S.B < 5 mg/dl), group B (5 < T.S.B < 10 mg/dl) and group C (T.S.B > 10 mg/dl).

Blood sampling: taken from all babies in the three groups by capillary venous sampling from a heel foot of babies by capillary tube.

Hematocrit (HCT) assay

The capillary tube should be filled with blood (about ¾) seal one end of the capillary with clay, place the duplicate capillary tube in the microhaematocrite centrifuge as balance and close it , set the timer for 5 minutes and fix speed of microcentrifuge at 10000 (RPM), measure the HCT by using special rule.

Total serum bilirubin (T.S.B) assay

TSB were obtained by put the capillary tube that contain sample in the bilirubin meter instrument and then we recorded the results.

RESULTS

We used Minitab program static for statistical analyses of mean parameters total serum bilirubin and hematocrit, the results showed there is a positive relation between the mean values of total serum bilirubin (TSB) with the mean value of hematocrit (HCT). In meaning if there was declined of the mean value of TSB that showed in group A (Fig. 1) there will be decline of the mean value of HCT too in the same group A (Fig 2). Also when there was elevated of the mean value of TSB that showed in group C (Fig 1), there will be elevate of the mean value of HCT too in the same group C (Fig 2), All results had been summarized in table 1.

DISCUSSION

In this study we focused on a physiologic jaundice, that it is a common type of jaundice occurs during the first week of life all newborn, we investigative, if there is relationship between the total serum bilirubin level (TSB) with the hematocrit level (HCT), and from the results in this search we found there is a positive relation between TSB and HCT Results showed the lower mean TSB level was 2.9 mg/dl it's had 45.8 % of HCT , and in higher mean TSB level 12.3 mg/dl it's had 56.7 % of HCT , this results proved these relation between them and that was agreement with many of research like (Meredith *etal.*¹² & Erica *etal.*²¹) have proved this relation between them, and it is happen due to relative polycythemia (high red blood cells count) and increased red blood cell turnover in neonates that the level of bilirubin increased after birth for many reasons and the main reason is break down of red blood cells as well as the immature liver function (Behrman *et al.*, 2000; Meredith *et al.*, 2002; Marks and Glader, 2009; Jeffery *et al.*, 2009 & Gartner and Herschel, 2001).

Also average of mean TSB level in this study were with normal range 7.7mg/dl and average of mean HCT level 51.8% had normal range, our finding were Similar findings in the study carried out by (Jeffery *et al.*, 2009 & Amar *et al.*, 2016) that showed Total serum bilirubin (T.S.B) value in the physiological jaundice should be between (5- 15) mg/dl for healthy newborn Also normal hematocrit for them had been value of 61%.

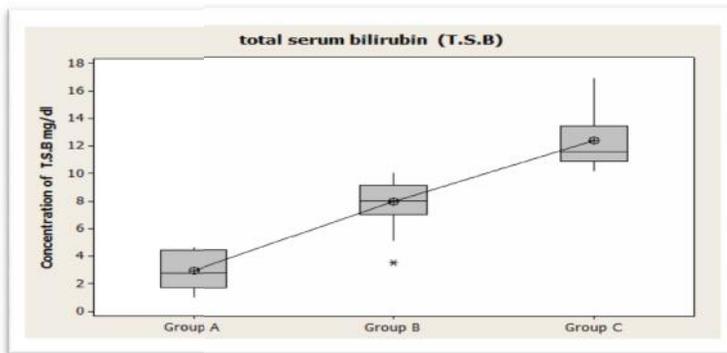


FIGURE 1: mean value of total serum bilirubin in newborn with neonatal jaundice .
Group A : TSB < 5 mg/dl, Group B : TSB = 5 - 10 mg/dl, Group C : TSB > 10 mg/dl

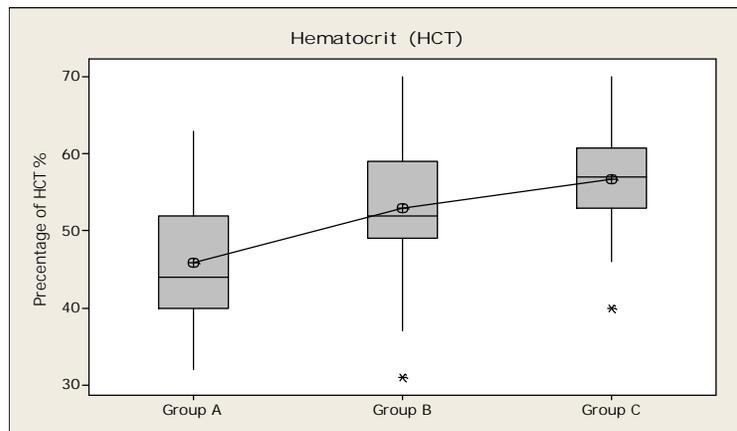


FIGURE 2: The mean value of Hematocrit (HCT) in newborn with neonatal jaundice .

Group A : Mean of HCT % , have (TSB < 5 mg/dl), Group B : Mean of HCT % , have (TSB = 5 - 10 mg/dl)
Group C : Mean of HCT % , have (TSB > 10 mg/dl)

TABLE 1: The mean of the total serum bilirubin (TSB) parameter and hematocrit (HCT) parameter.

Parameters	Group A= (T.S.B<5mg/dl)	Group B = (T.S.B=5-10mg/dl)	Group C = T.S.B >10mg/dl)	Average mean for A,B and C
Mean of T.S.B mg/dl	2.9	7.9	12.3	7.7
Mean of HCT % 100	45.8	52.9	56.7	51.8

REFERENCES

CT government health J. (2012) Neonatal Jaundice, Approved by Canberra Hospital Neonatal Intensive Care Unit.

Altman, P.L. and Dittmer, D.S. (1961) Blood and Other Body Fluids. Federation of American Societies for Experimental Biology, Washington, D.C.

Amar Shah, Dr. C. K. Shah, Dr. Venu Shah (2016) Study Of Hematological Parameters Among Neonates Admitted With Neonatal Jaundice. Journal of Evolution of Medical and Dental Arthur E. Kopelman, MD., Jaundice in Newborns (Hyperbilirubinemia). The Brody School of Medicine at East Carolina University, Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ, USA.

Behrman, R.E., Kliegman, R.M., Jenson, H.B. (2000) eds. Jaundice and hyperbilirubinemia in the newborn. In: Nelson Textbook of pediatrics. 16th ed. Philadelphia: Saunders, 511–28.

Berg, Jeremy M., John, L. Tymoczko New York, NY [u.a.]: W. H. Freeman. p. Section 10.2 Hemoglobin Transports Oxygen Efficiently by Binding Oxygen Cooperatively. ISBN 0-7167-3051-0USA

Bhutani, V.K., Johnson, L.H., Maisels, J.M. (2004) Kernicterus: Epidemiological strategies for its prevention through systems-based approaches. J Perinatol., 24:650-62.

Clemons RM. Issues in newborn care. Prim Care, 2000; 27:251-67.

CPS (2007) Canadian Paediatric Society. Position Statement (FN 2007-02) Guidelines for detection,

management and prevention of hyperbilirubinemia in term and late preterm newborn infants (35 or more weeks' gestation). Pediatr Child Health; 12:1B-12B.

Dennery, P.A., Seidman, D.S., Stevenson, D.K. (2001) Neonatal hyperbilirubinemia. N Engl J Med., 344:581-90.

Erica Hyman Kates and Jacqueline S. Kates, In Brief: Anemia and Polycythemia in the Newborn, Pediatrics in Review 2007; 28; 33. DOI: 10.1542/pir.28-1-33. Downloaded from <http://pedsinreview.aappublications.org/> by guest on January 25, 2017.

Gartner, L.M., Herschel, M. (2001) Jaundice and breastfeeding. Pediatr Clin North Am. 48:389–99.

Gautam Ghawla (2016) prediction of significant neonatal hyperbilirubinemia in healthy term newborns using cord bilirubin and 24 TH hour serum bilirubin, 2016, Bangalore- Karnataka / Bijapur .p:22, 93.

Jeffery Jopling, Erick Henry, MPH, Susan E. Wiedmeier, M.D. Robert, D. Christensen, M.D. (2009) Reference Ranges for Hematocrit and Blood Hemoglobin Concentration During the Neonatal Period: Data From a Multihospital Health Care System, Journal of the American Academy of Pediatrics ,123:e333–e337.

Maisels, M.J. (1981) Neonatal jaundice in: Gleason, Ballard Eds. Neonatology pathophysiology and management of newborn. 2nd edn. Philadelphia, JB Lippincot. p473-554.

Maisels, M.J., Newman, T.B. (1995) Kernicterus in otherwise healthy, breastfed term newborns. Pediatrics; 96(4 Pt 1):730-3.

- Marks, P.W., Glader, B., Reference ranges, Approach to Anemia in the Adult and Child. Hoffman F, Benz EJ, Shattil SJ, eds. Hematology: Basic Principles and Practice. 5th ed. Philadelphia, PA: Churchill Livingstone; 2009. Chap 34:439-46.
- Melton, K., Akinbi, H.T. (1999) Neonatal jaundice. Strategies to reduce bilirubin-induced complications. *Postgrad Med.*, 106:167–8,171–4,177–8.
- Meredith, L. Porter, CPT, MC, USA, and Beth L. Hyperbilirubinemia in the Term Newborn .DENNIS, MAJ, MC, USA Dewitt Army Community Hospital, Fort Belvoir, Virginia, *Am Fam Physician*. 2002 Feb 15; 65(4): 599-607.
- Muchowski, K.E. (2015) Evaluation and treatment of neonatal hyperbilirubinemia. *Am Fam Physician*. 2014 Jun 1; 89(11):873-8.
- NICE CKS, Jaundice in the newborn, November 2015 (UK access only)
- NICE, Clinical Guideline. Jaundice in newborn babies under 28 days; (released 2010, updated Oct 2016).
- NICE, Neonatal jaundice -98, National Institute for Health and Clinical Excellence; London: 2010 :1-53 p.
- Riskin, A., Kugelman, A., Abend-Weinger, M., Green, M., Hemo, M., Bader, D. (2003) In the eye of the beholder: How accurate is clinical estimation of jaundice in newborns? *Acta Paediatr*, 92:574-6.(Erratum in 2005;94:1168).
- Rodgers, G.P., Dover, G.J., Uyesaka, N., Noguchi, C.T., Schechter, A.N., Nienhuis, A.W. (January 1993). "Augmentation by erythropoietin of the fetal-hemoglobin response to hydroxyurea in sickle cell disease". *The New England Journal of Medicine*. 328 (2): 73–80.
- Ullah, S., Rahman, K., Hedayati, M. (2016) Hyperbilirubinemia in Neonates: Types, Causes, Clinical Examinations, Preventive Measures and Treatments: A Narrative Review Article. *Iran J Public Health*. 2016 May;45(5):558-68.
- Wintrobe, M.M., Lee, G.R. (1999) *Wintrobe's Clinical hematology*. 10th ed. Baltimore: Williams & Wilkins, 1999:267–89.