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Comorbidities of Phototherapy Used in Neonatal Jaundice in Diyala Governorate- Iraq.

A Thesis

Submitted to the College of Medicine and Committee of Postgraduate Studying of University of Diyala in a partial Fulfillment of the Requirements for the Degree of Master in Pediatrics

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جمهورية العراق

وزارة التعليم العالي والبحث العلمي

جامعة ديالى

كلية الطب

تأثير العلاج الضوئي الذي يستخدم لعلاج اليرقان الولادي في محافظة ديالى، العراق.

رسالة مقدمة الى مجلس كلية الطب_جامعة ديالى وهي جزء من متطلبات نيل شهادة الماجستير في طب الاطفال

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سورة طه الآية (**114**)

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We certify that this thesis entitled (Effect of Phototherapy Used in Neonatal Jaundice in Diyala Province- Iraq) was prepared by (Saif Hakeem Tofiq) under our supervision at the college of medicine, University of Diyala in a partial Fulfillment of the Requirement for the Degree of Master in Pediatrics.

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Dedication

To martyrs of Iraq from the security forces and congregate peoples' consecrator and my mother, the martyr Fatima Dawood Solaiman.

To my wife Dr. Tahreer S. Ali and to all members in my family thanks for your support.

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Summary

Neonatal jaundice is the yellowish discoloration of the sclera and skin caused by hyperbilirubinemia, it is one of the most common conditions confronting neonatologists daily. It's a serious condition that may result in fatal complications if not treated properly and in a timely manner. This condition is caused by an excess of bilirubin in the blood, a yellow substance created from the degradation of red blood cells. Bilirubin is broken down by the liver and binding to albumin and being excreted as bile. Neonates in the first few days after birth produce 6 to 8 mg/kg/24h, more than twice as much as adults.

To assess the comorbidities in neonate, of phototherapy used in treatment of neonatal jaundice**.**

A cross sectional study conducted at Al-Batool teaching hospital for maternity and child in Diyala governorate Iraq. The period started from the 1st of Aug. 2017 to the 1st of Jan. 2018. One hundred neonates with jaundice need for treatment with phototherapy was included in the current study.

The mean age of neonates was 2.6±2.3 days; 64% of them were less than 3 days age. Seventy tow percent of neonates with jaundice were delivered by NVD. Resuscitation was done for 56% of neonates while 48% of them were directly admitted to NICU. The common type of maternal infection was UTI 44%. The skull bone changes of neonates with jaundice by x-ray were found for 52% of them**.** Mean birth weight of neonates with jaundice was 3.3±0.82 Kg, while after phototherapy was 3.2±0.79 Kg, with significant reduction after phototherapy ($p<0.001$). Exchange transfusion was done for 17% of neonates and repeated in 8% of them. ABO differences in blood groups were detected in 51% of neonates with jaundice and RH differences were

detected in 28% of them. The common co-morbidities after phototherapy were skin rash 89%, bronze baby syndrome 2.0%, dehydration 51%, diarrhea 46%, eye injury 16%, eye trauma 9% and thrombocytopenia 2%.

More than half of the babies were suffering from one or more co-morbidities after treatment with phototherapy. The majorities were suffering from skin rash, dehydration, diarrhea and eye injury.

List of abbreviations:

Abbreviation	Text
AAP	American Association of Pediatrics
ABE	Acute bilirubin encephalopathy
CBE	Chronic bilirubin encephalopathy
CI	Confidence interval
CPAP	Continuous Positive Airway Pressure
CS	Cesarean section
CU	Cervical ulcer
DEXA	Dual-energy X-ray absorptiometry
DM	Diabetes mellitus
ELBW	Extensive low birth weight
et al	Et Alia (*Latin*) : And Others (English)
ETCO	End-tidal carbon monoxide
G6PD	Glucose-6-phosphate dehydrogenase deficiency
HICs	High-income countries
HPLC	High performance liquid chromatography
IUD	Intrauterine death
LED	Light-Emitting Diode
LMICs	low- and middle-income countries
NICE	National Institute for Health and Care Excellence
NICU	Neonatal intensive care unit
NNJ	Neonatal jaundice
NNPT	Neonatal phototherapy
NVD	Normal vaginal delivery
PDA	Patent ductus arteriosus
PET	Preeclampsia
PPH	Postpartum hemorrhage
PUC	Premature uterine contraction
QUS	Quantitative Ultrasound
OFC	Occipito-frontal circumference
ROP	Retinopathy of prematurity
SD	Standard Deviation (Statistics)
Sig	Significant (Statistic)

List of abbreviations:

SPSS	Statistical Package For Social Sciences
TCB	Transcutaneous bilirubinometer
TNF	Tumor necrosis factor
TTN	Transient tachypnea of the newborn
UB	Unconjugated bilirubin
UTI	Urinary tract infection
WHO	World Health Organization
ANS	Anilino-1-naphthalene sulfonic acid

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

1.2. Background: Neonatal jaundice, the yellowish discoloration of the sclera and skin caused by hyperbilirubinemia, which is one of the most common conditions confronting neonatologists daily **(Rennie J et al, 2010).**

Neonatal jaundice a serious condition that may result in fatal complications if not treated properly and in a timely manner. This condition is caused by an excess of bilirubin in the blood, a yellow substance created from the degradation of red blood cells, which give bilivirdin and ferrous bilivridin then metabolize to bilivirubin. Bilirubin is broken down by the liver in a healthy adult by binding to albumin and being excreted as bile. Neonates in the first few days after birth produce 6 to 8 mg/kg/24h, more than twice as much as adults, due to the increased red blood cell turnover rate. Bilirubin production usually declines 10 to 14 days after birth, for this reason, the risk of jaundice and complications resulting from the hyperbilirubinemia is highest in the few days directly following birth**(Vaez A,2016).**

1.3. Incidence/prevalence: Jaundice is the most common condition requiring medical attention in newborn babies, and about 50% of term and 80% of preterm babies develop jaundice in the first week of their life **(Kumar R, 1999).** Jaundice is also a common cause of re-admission to hospital after early discharge of newborn babies. It usually appears 2 to 4 days after birth and disappears 1 to 2 weeks later, usually without the need for treatment **(Gale R et al, 2001).**

1.4. Epidemiology: Hyperbilirubinemia is one of the most common causes of morbidity in newborns worldwide, and the most frequent cause of hospitalization or readmission for special care in the 1st week of life **(YICSSG, 2008; Burke B et al, 2009; NIHCE, 2017;)**.

Recent global estimates suggest that every year, roughly 1.1 million babies would develop severe hyperbilirubinemia and the vast majority reside in sub-Saharan Africa and South Asia **(Bhutani V et al, 2013).** Available evidence also shows that severe hyperbilirubinemia, with or without bilirubin encephalopathy, is associated with substantial mortality and long-term morbidities in low- and middle-income countries (LMICs), **(Olusanya B et al,2014; Slusher T and Olusanya B, 2012; Mwaniki M et al, 2012; Maulik P and Darmstadt G, 2007).**

Over 60% of all newborns develop neonatal jaundice (NNJ), a physiologic condition characterized by yellowish discoloration of the skin and conjunctiva as a consequence of increased levels of serum bilirubin during the first week of life **(Olusanya B et al, 2014; Burke B et al, 2009).** Neonatal jaundice is usually benign, but in some cases, it can progress to severe hyperbilirubinemia, acute bilirubin encephalopathy (ABE) and kernicterus/chronic bilirubin encephalopathy (CBE), **(YICSSG, 2008;Volpe J,2008; Maisels MJ,2015)**. Acute bilirubin encephalopathy and Chronic bilirubin encephalopathy are largely preventable if severe hyperbilirubinemia is identified early and treated promptly with effective phototherapy or, for hazardous cases, exchange transfusion. Guidelines for managing jaundice have been proposed by the American Association of Pediatrics (AAP), the UK National Institute for Health and Care Excellence (NICE) and others **(WHO, 2014; WHO, 2013; Olusanya B et al, 2016).**

With improvements in prevention and treatment, the number of cases of severe hyperbilirubinemia in high-income countries (HICs) has decreased markedly since the 1990s. It is assessed by population-based studies and registries, the incidence of severe hyperbilirubinemia in

HICs is currently estimated to be about 31.6/100,000 live births (95% CI 11.8-51.3), while the incidences of ABE and CBE have been estimated as being in the range of 1.0-3.7 and 0.4-2.7/100,000 live births, respectively**(Bhutani V, 2012; Bhutani V et al, 2010)**.

1.5. Bilirubin metabolism Pathway: Bilirubin is the end product of heme catabolism in the intravascular compartment. About 80% of bilirubin results from the degradation of erythrocyte hemoglobin in the reticulo-endothelial system. The remaining (20%) derives from degradation of myoglobin and other heme-containing proteins, such as cytochromes, and inefficient erythropoiesis in bone marrow (London et al., 1950). Heme oxygenase degrades heme into biliverdin, which is then reduced to UCB by the enzyme biliverdin reductase (Figure 1.1), **(Vodret S, 2016).**

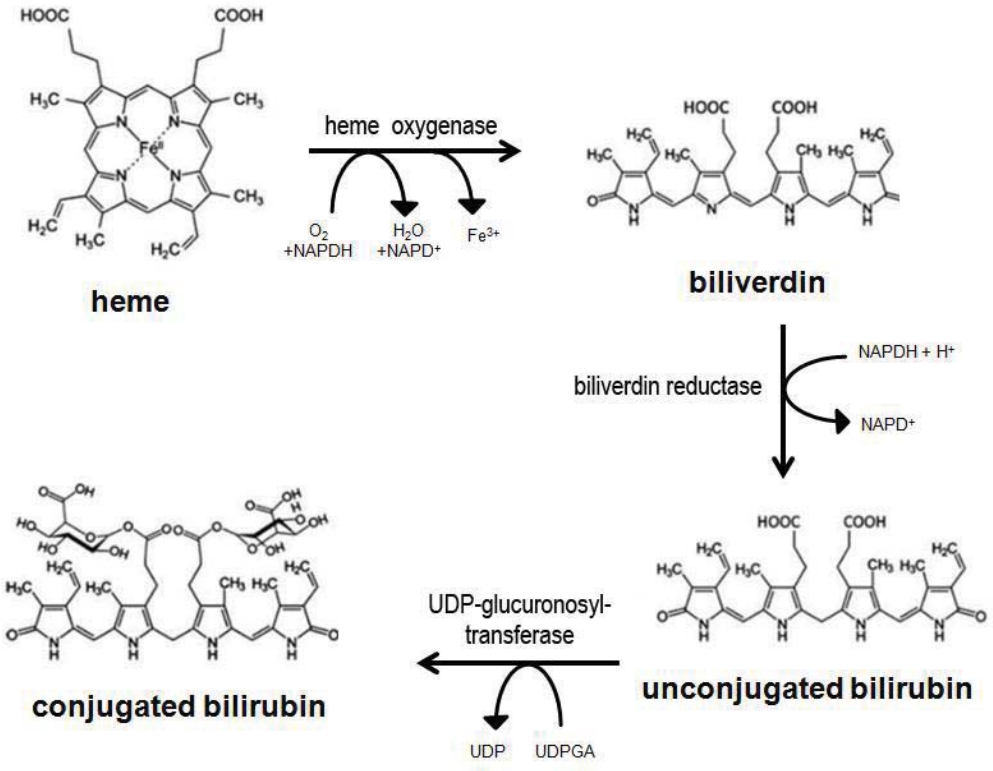

Figure 1.1 .Metabolic reactions of bilirubin pathway.

Heme, biliverdin, bilirubin and conjugated bilirubin structures are indicated, as well as the relative by-products and enzymes of each reaction **(Vodret S, 2016).**

1.6. Aim of the study:

The aim of the current study to assess the comorbidities of phototherapy used in neonatal jaundice in Diyala governorate of Iraq.