# Exchange Transfusion versus Intravenous Immunoglobulins in Treatment of Isoimmune Hemolytic Neonatal Jaundice

**Thesis**

Submitted for partial fulfillment for Master Degree

in Pediatrics

**By**

**Rehab Nadeem Abd El-Shafey**
M.B., B.Ch, (2003)

**Under Supervision of**

**Prof. Dr. Laila Hussein Mohamed**
Professor of Pediatrics
Faculty of Medicine, Cairo University

**Prof. Dr. Ismail Bahie El-Din El-Hawary**
Professor of Pediatrics
Faculty of Medicine, Cairo University

**Dr. Mai Ahmed Khairy**
Assistant Professor of Pediatrics
Faculty of Medicine, Cairo University

**Faculty of Medicine**
**Cairo University**
**2011**

بسم الله الرحمن الرحيم

قَالُوا سُبْحَانكَ لاَ علِمَ لَنَا إِلاّ مَا
عَلّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)


*To my dear **Father**; who taught me how to love, scarify and how to be a genuine person*

*To my dear country, **EGYPT**, to which I am proud to belong*

*To **everyone** scarified his soul for our rights…we will never forget you*

*To my dear **family**…who provided me with love and support*

# Acknowledgment

*First and foremost, I fell always indebted to **Allah**, the most kind and the most merciful.*

*I would like to express my sincere thanks to **Prof. Dr. Laila Hussein Mohamed,** Professor of Pediatrics, Faculty of Medicine, Cairo University for her supervision, guidance, valuable advice and helpful directions.*

*My extreme thanks and gratefulness to **Prof. Dr. Ismail Bahie El-Din El-Hawary,** Professor of Pediatrics, Faculty of Medicine, Cairo University, for his keen interest, beneficial advice, constant support and scientific opinions.*

*I also wish to offer my warmest and deeppest appreciation to **Dr. Mai Ahmed Khairy,** Assistant Professor of Pediatrics, Faculty of Medicine, Cairo University, for her unlimited, endless help and continuous encouragement.*

# Abstract

**Key words: (hemolytic jaundice- exchange transfusion- intravenous Immunoglobulins)**

Progressive hemolytic jaundice is conventionally treated with phototherapy and exchange transfusion. Recent studies have demonstrated that the use of intravenous immunoglobulins is promising in its management. In Our study 40 neonates with neonatal jaundice due to ABO and Rh incompatibility were studied. They were divided into 2 groups; one treated with immunoglobulins and other treated with exchange .We concluded that immunoglobulins decreases the level of serum bilirubin as exchange transfusion and in addition it shortens the period of hospitalization and phototherapy with no side effects detected.

# Table of Contents

# List of Tables

**Page No.**

# List of Figures

**Page No.**

# List OF Abbreviations

**AAP** : American Academy of Pediatrics
**ALT** : Alanine Transaminase
**AST** : Aspartate Transaminase
**ATP** : Adenosine Triphosphate
**$B_F$** : Free Bilirubin
**CHT** : Congenital hypothyroidism
**CNS** : Central Nervous System
**CO** : Carbon monoxide
**CPD** : Citrate phosphate dextrose
**ELBW** : Extremely low-birthweight
**ETCO** : End Tidal carbon monoxide in Breath
**Fab** : Fragment, Antigen Binding
**Fc** : Fragment, Crystallizable
**FFA** : Free fatty acids
**G6PD** : Glucose -6- phosphate-Dehydrogenase Deficiency
**GGT** : G-Glutamyl Transferase
**Hb** : Hemoglobuin
**HBV** : Hepatitis B Virus
**Hct** : Hematocrite
**HCV** : Hepatitis C Virus
**HDN** : Hemolytic disease of newborn
**HE** : Hereditary Elliptocytosis
**HIDA** : Hepatoiminodiacetic acid
**HIV** : Human Immunodeficiency Virus
**I/T** : Immature to total ratio
**Ig** : Immunoglobulin
**IgA** : Immunoglobulin A
**IgD** : Immunoglobulin D
**IgE** : Immunoglobulin E
**IgG** : Immunoglobulin G
**IgM** : Immunoglobulin M

**IPT** : Intraperitoneal transfusion
**IUT** : Intrauterine transfusion
**IVIG** : Intravenous Immunoglobulins
**IVT** : Intravascular transfusion
**MRI** : Magnatic Resonant Imaging
**NADPH** : Nicotinamide adenine dinucleotide phosphate
**NAIT** : Neonatal alloimmune thrombocytopenia
**NAN** : Neonatal alloimmune neutropenia
**NEC** : Necrotising enterocolitis
**NH** : Neonatal hemochromatosis
**PK** : Pyruvate kinase
**Plt** : Platlets
**PPARs** : Peroxisme-Prolifitated Activated Receptors
**RBC** : Red blood cells
**SGOT** : Serum Glutamic Oxaloacetic Transaminase
**SGPT** : Serum Glutamic Pyruvic Transaminase
**TCB** : Transcutaneous Bilirubinometry
**TLC** : Total leucocytic count
**TSB** : Total serum bilirubin
**UCB** : Unconjugated bilirubin
**UDPG-T** : Uridine-Diphosphoglucuronyl Transferase
**WBC** : White blood cells

# Introduction

Neonatal hyperbilirubinemia is a commonly seen neonatal problem, approximately 60-70% of term infants and 80% of preterm infants develop jaundice in the first week of life. Although transient, the condition accounts for up to 75% of hospital readmission in the first week after birth ***(Shapiro, 2006).***

Neonatal jaundice secondary to isoimmune hemolytic anemia (Rh-ABO incompatibility) is a cause of high serum bilirubin level due to hemolysis of red blood cells secondary to transplacental passage of antibodies.

Sensitization in Rh incompatibility occurs when an Rh D-negative mother may first encounter the D antigen while being pregnant with Rh D-positive child, or by receiving a blood transfusion of Rh D-positive blood. Once the mother has been sensitized her immune system produces IgM isotope that do not cross the placenta, later it produces IgG isotope that transverse the placental barrier ***(Urbaniak and Gresis, 2000).***

The O positive mothers have Ig anti-A or anti-B antibodies, 10% to 15% of them are IgG producers . When an A or B positive newborn is born to an O positive mother, the O positive red cells with high titers of anti-A or anti-B cross the placental barrier and reach the fetal circulation and cause hemolysis. ABO incompatibility causes less severe anemia and jaundice than Rh incompatibility ***(Bhat, 2005).***

The degree to which the fetus is affected correlates with the amount of maternal antibody that crosses the placenta ***(Koeing, 2000).***

This leads to increased risk of acute bilirubin encephalopathy and kernicterus ***(Murray and Roberts, 2007).***

**Exchange transfusion** is sometimes needed besides the conventional therapy (phototherapy) as it corrects anemia associated with hemolysis and is effective in removing sensitized red blood cells before they are hemolyzed. It also removes about 60% of bilirubin from the plasma, resulting in a clearance of about 30% to 40% of total bilirubin as it equilibrates with the extravascular tissue. Exchange transfusion is not without a risk. It carries a 5% risk of major morbidity and the risks associated with blood exposure. Infants receiving exchange transfusion have increased risks of infection, necrotizing enterocolitis, acidosis, hypocalcaemia, hypoglycemia, electrolyte abnormalities and air embolism ***(Patra, 2004).***

In recent years, intravenous immunoglobulins (IVIG) have been successfully used in isoimmune hemolytic anemia (Rh-ABO incompatibility) **(*American Academy of Pediatrics, 2004*).**

It has been found that after IVIG administration there was a significant fall in total serum bilirubin level and no exchange transfusions were required ***(Walsh et al., 2008).***

None of the studies of IVIG use for Hemolytic Disease of the newborn reported any serious side effects; they are very rare but include hypersensitivity and anaphylaxis ***(Gottstein and Cooke, 2003).***

**Intravenous immunoglobulins (IVIG)** were found to decrease hemolysis leading to reduction in serum bilirubin level. The immunoglobulin could act by occupying the Fc receptors of reticulo-endothelial cells preventing them from taking up and lysing antibody coated RBCs ***(Walsh and Molloy, 2009).***

# Aim of the Work

1. To assess the effectiveness of IVIG in reducing the need for exchange transfusion, the duration of phototherapy and hospital stay.

2. To compare between the efficiency of exchange transfusion and IVIG in lowering level of TsB in neonates suffering from indirect hyperbilirubinemia due to Rh and ABO incompatibility.