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INCIDENCE AND ETIOLOGY OF NEONATAL JAUNDICE IN NICU: AN ANALYTICAL STUDY OF CLINICAL AND LABORATORY CHARACTERISTICS

Ajja Hrithik, Vade Akash, Varaganti Naga Haripriya, Zeba Sultana, Dr. Praveen Kumar T

Malla Reddy College Of Pharmacy, Hyderabad, Telangana

Abstract— **Hyperbilirubinemia, commonly referred to as jaundice, is a perilous condition that poses a significant threat to newborns Neonatal jaundice, often requires clinical attention. This study investigates factors associated with its severity in 150 newborns, exploring neonatal age, gender, term of pregnancy, type of delivery (LSCS or NVD), type of feeding, ABO and RH incompatibility, as well as direct and indirect bilirubin levels. These findings underscore the importance of continued monitoring, especially for neonates over 3 days old, breastfed infants, and those with ABO incompatibility or elevated indirect bilirubin levels. Further research is essential to explore underlying mechanisms and develop effective strategies for early detection and management of neonatal jaundice.**

Index Terms— Jaundice, Hyperbilirubinemia, Hemolysis, Hepatobiliary, Phototherapy, Kernicterus, ABO incompatibility, Rh incompatibility

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I. INTRODUCTION

Neonatal jaundice : Neonatal jaundice or neonatal hyperbilirubinemia results from elevated total serum bilirubin (TSB) and clinically manifests as yellowish discoloration of the skin, sclera, and mucous membrane. The term jaundice derives from the French word "jaune," which means yellow. It is the most commonly encountered medical problem in the first two weeks of life and a common cause of readmission to the hospital after birth.[1] Approximately 60% of term and 80%of preterm newborns develop clinical jaundice in the first week after birth.[2]

Etiology

Jaundice peeking on the third to fifth day of life is likely to be caused by normal newborn physiology. However a pathological cause of jaundice may co exist with physiological jaundice [5]

Causes of jaundice:

Unconjugated Hyperbilirubinemia (UHB) or Indirect Hyperbilirubinemia

Unconjugated hyperbilirubinemia is the more common type and is either physiological or pathological. Physiological jaundice accounts for 75% of neonatal hyperbilirubinemia and results from a physiological alteration in neonatal bilirubin metabolism. Unconjugated hyperbilirubinemia usually results from dysregulation in the bilirubin metabolism that includes increased production, impaired hepatic uptake and decreased conjugation of bilirubin.

Conjugated Hyperbilirubinemia (CHB) or Direct Hyperbilirubinemia

Conjugated hyperbilirubinemia, also referred to as neonatal cholestasis, is characterized by elevation of serum conjugated/direct) bilirubin (> 1.0 mg/dL) and is due to impaired hepatobiliary function. [7]

Increased bilirubin production

Increased bilirubin production and consequential unconjugated hyperbilirubinemia can result from increased catabolic degradation of hemoglobin and other haem proteins, typically due to accelerated hemolysis, a large hematoma, dyserythropoiesis or sometimes due to destruction of transfused erythrocytes. [8]

Decreased Bilirubin Clearance

Reduced hepatic bilirubin clearance can be due to defective

(i) Unconjugated bilirubin uptake and intrahepatic storage

(ii) conjugation of glucuronic acid to bilirubin [9]

Immune mediated hemolysis:

It is seen with blood group incompatibility such as ABO/RH incompatibility and leads to hemolytic disease of newborns (HDN).

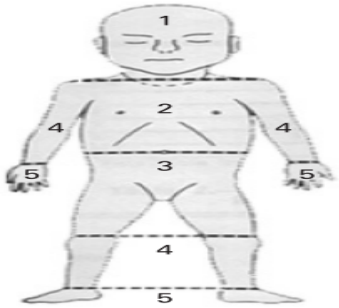
ABO incompatibility: The most common type of maternofetal blood group incompatibility is ABO hemolytic disease of the newborn (ABO HDN). Unlike Rh (rhesus) incompatibility, which typically affects the fetus during pregnancy, ABO HDN primarily impacts the newborn after birth. ABO HDN is almost exclusively seen in babies with blood group A or B born to mothers with blood group O who have developed immune antibodies against blood group A or B antigens

Rh factor incompatibility

Rh incompatibility is always pathological condition. During pregnancy or delivery, exposure of a Rh-negative mother to a Rh-positive fetus is the most frequent cause of Rh incompatibility

JAUNDICE ASSESMENT:

Kramer's rule is a method used to assess jaundice in newborns. It involves visually evaluating the baby's skin for signs of jaundice by starting at the head and moving down to the feet as the level of jaundice increases. This assessment is typically done in natural light, and the examiner may gently press on the baby's skin to observe the underlying tone.



Grade	Extent of jaundice
0	None
1	Face and neck only
2	Chest and back
3	Abdomen below umbilicus to knees
4	Arms and legs below knees
5	Hands and feet

Aim and objectives

Aim

The aim of the project "Incidence and Etiology of Neonatal Jaundice in NICU: An Analytical Study of Clinical and Laboratory Characteristics" is to study the etiological profile of neonatal jaundice and correlation between severity of jaundice and etiology

Objectives

To assess the levels of bilirubin in neonates diagnosed with jaundice within the first 28 days of life.

Describe various causes of neonatal jaundice.

Identify physiological jaundice and differentiate it from pathological jaundice.

Assess the relationship between neonatal jaundice severity and other clinical and laboratory parameter, such as bilirubin levels

Methods and Materials

Study site: In patients willing to participate in the study from the department of pediatric unit at Malla Reddy Hospitals.
Study period: The planned timeline for the study was 6-month duration
Study size: The sample size for the study was estimated to be approximately 150 participants
Study design: An analytical study
"Incidence and Etiology of Neonatal Jaundice in NICU: An Analytical Study of Clinical and Laboratory Characteristics" refers to a research study that aims to investigate the frequency and causes of neonatal jaundice in the Neonatal Intensive Care Unit (NICU)

Study materials

Data collection form

Questionnaire

Patient consent form

Study criteria

Inclusion Criteria:	Exclusion Criteria:
• Neonates diagnosed with jaundice within the first 28 days of life. • Complete medical records including birth weight, gestational age, and maternal medical history. • Blood samples collected for bilirubin analysis within 72 hours of jaundice diagnosis. • Written informed consent obtained from the parents or guardians of the neonates.	• Neonates with known genetic disorders or congenital anomalies. • Neonates with severe underlying medical conditions, such as sepsis or respiratory distress syndrome. • Neonates receiving blood transfusions or phototherapy prior to blood collection. • Neonates with incomplete medical records or missing bilirubin levels.

Study procedure:

Recruitment of study participants: Newborns with symptoms of jaundice, such as yellow skin and whites of the eyes, will be recruited for the study. Informed consent will be obtained from the parents or guardians.

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Measurement of bilirubin levels: Blood samples will be collected from the study participants to measure the level of bilirubin in the blood using laboratory methods.

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Evaluation of other potential causes of jaundice: The study participants will undergo a thorough medical evaluation to rule out other potential causes of jaundice, such as anemia, infection, or liver disease.

↓

Correlation analysis: The data collected on the level of bilirubin and other potential causes of jaundice will be analyzed to determine the correlation between the two variables.

↓

Data interpretation and conclusions: The results of the study will be interpreted and conclusions will be drawn on the utility of bilirubin as a marker of neonatal jaundice and the factors that contribute to elevated levels of bilirubin in newborns.

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Dissemination of results: The findings of the study will be published in peer-reviewed journals or presented at conferences to disseminate the information to the scientific community and medical practitioners.

RESULTS AND DISCUSSION

CORELATION BETWEEN NEONATAL JAUNDICE AND CAUSATIVE FACTORS OF NEONATAL JAUNDICE

NEONATAL JAUNDICE			
	P-Value	**Frequency(N)**	**Corelation**
Age Groups	**0.022**	**150**	**+VE**
Gender	**0.521**	**150**	**-VE**
Terms Of Pregnancy	**0.165**	**150**	**-VE**
Type Of Delivery	**0.067**	**150**	**-VE**
Type Of Feeding	**0.017**	**150**	**+VE**
ABO Incompatibility	**0.028**	**150**	**+VE**
RH Incompatibility	**0.188**	**150**	**-VE**
Direct Bilirubin	**0.88**	**150**	**-VE**
Indirect Bilirubin	**0.000**	**150**	**+VE**

TABLE DEPICTING CORELATION BETWEEN NEONATAL JAUNDICE AND CAUSATIVE FACTORS OF NEONATAL JAUNDICE

Age Groups (Positive Correlation, p-value = 0.022):
INFERENCE: There is a statistically significant positive correlation ($p < 0.05$) between age groups and the severity of neonatal jaundice. This suggests that as the age of neonates increases, the severity of jaundice tends to increase.

Gender (Negative Correlation, p-value = 0.521):
INFERENCE: There is no statistically significant correlation ($p > 0.05$) between gender and the severity of neonatal jaundice. Gender does not appear to be a significant factor in determining jaundice severity in this dataset.

Terms Of Pregnancy (Negative Correlation, p-value = 0.165):
INFERENCE: There is no statistically significant correlation ($p > 0.05$) between the terms of pregnancy and the severity of neonatal jaundice. The duration of pregnancy does not appear to be a significant factor in determining jaundice severity in this dataset.

Type Of Delivery (Negative Correlation, p-value = 0.067):
INFERENCE: There is no statistically significant correlation ($p > 0.05$) between the type of delivery and the severity of neonatal jaundice. The method of delivery does not appear to be a significant factor in determining jaundice severity in this dataset.

Type Of Feeding (Positive Correlation, p-value = 0.017):
INFERENCE: There is a statistically significant positive correlation ($p < 0.05$) between the type of feeding and the severity of neonatal jaundice. This suggests that the type of feeding may have an influence on jaundice severity, with certain types of feeding associated with more severe jaundice.

ABO Incompatibility (Positive Correlation, p-value = 0.028):
INFERENCE: There is a statistically significant positive correlation ($p < 0.05$) between ABO incompatibility and the severity of neonatal jaundice. Neonates with ABO incompatibility may be more likely to experience more severe jaundice.

RH Incompatibility (Negative Correlation, p-value = 0.188):
INFERENCE: There is no statistically significant correlation ($p > 0.05$) between RH incompatibility and the severity of neonatal jaundice. RH incompatibility does not appear to be a significant factor in determining jaundice severity in this dataset.

Direct Bilirubin (No Correlation, p-value = 0.88):
INFERENCE: There is no statistically significant correlation ($p > 0.05$) between direct bilirubin levels and the severity of neonatal jaundice in this dataset.

Indirect Bilirubin (Positive Correlation, p-value = 0.000):
INFERENCE: There is a statistically significant positive correlation ($p < 0.05$) between indirect bilirubin levels and the severity of neonatal jaundice. Higher indirect bilirubin levels are associated with more severe jaundice.

DISCUSSION:

A total of 150 newborns were considered for the present study, as they were satisfying inclusion and exclusion criteria. Among which 78 were female and 72 were male.
It is observed that neonatal jaundice was at higher range among the age group between 0-3 days which includes 76 neonates followed by 6-10 days, and 4-5 days and least cases among more than 10 days age group.
Neonatal jaundice was most commonly noted in babies delivered at more than 37 weeks to 38 weeks 6 days- EARLY TERM (52.7%).
Among 150 neonates mothers, 87 (58%) mothers have undergone LSCS(Lower Segment Caesarean Section) and 63 (42%) mothers have undergone NVD(Normal Vaginal Delivery
Age and Neonatal Jaundice: The data shows a statistically significant positive correlation between the age of neonates and the severity of neonatal jaundice ($p = 0.022$). This suggests that as neonates get older, they are more likely to develop more severe jaundice.
Gender and Neonatal Jaundice: There is no statistically significant correlation between gender and the severity of neonatal jaundice ($p = 0.521$). Gender does not appear to be a significant factor in determining jaundice severity.
Term of Pregnancy and Neonatal Jaundice: The duration of pregnancy (term) does not show a statistically significant correlation with jaundice severity ($p = 0.165$). This suggests that the timing of birth concerning full term or early/late term does not strongly influence jaundice severity in this dataset.
Type of Delivery and Neonatal Jaundice: There is no statistically significant correlation between the type of delivery and the severity of neonatal jaundice ($p = 0.067$). This indicates that the method of delivery (LSCS or NVD) does not play a significant role in determining jaundice severity.
Type of Feeding and Neonatal Jaundice: The type of feeding shows a statistically significant positive correlation with jaundice severity ($p = 0.017$). Breastfeeding appears to be associated with more severe jaundice compared to formula feeding.
ABO Incompatibility and Neonatal Jaundice: ABO incompatibility is positively correlated with the severity of neonatal jaundice ($p = 0.028$). Neonates with ABO incompatibility are more likely to experience more severe jaundice.
RH Incompatibility and Neonatal Jaundice: There is no statistically significant correlation between RH incompatibility and the severity of neonatal jaundice ($p = 0.188$). RH incompatibility does not appear to be a significant factor in determining jaundice severity in this dataset.
Direct Bilirubin Levels and Neonatal Jaundice: There is no statistically significant correlation between direct bilirubin levels and the severity of neonatal jaundice ($p = 0.88$). Direct bilirubin levels do not appear to strongly influence jaundice severity in this dataset.

Indirect Bilirubin Levels and Neonatal Jaundice: Indirect bilirubin levels show a statistically significant positive correlation with jaundice severity (p = 0.000). Higher indirect bilirubin levels are associated with more severe jaundice.

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