# Incidence and Risk Factors of Hyperbilirubinemia in Neonatal in Mosul City

انتشار وعوامل خطورة ارتفاع المادة الصفراء عند الأطفال حديثي الولادة
في مدينة الموصل

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الخلاصة

**خلفية البحث:** يعد ارتفاع المادة الصفراء من أكثر المشاكل التي يعاني منها الأطفال حديثي الولادة خلال الأسبوع الأول بعد ألولادة

**هدف الدراسة:** تهدف الدراسة إلى التعرف على نسبة حدوث ارتفاع مادة الصفراء وعوامل الخطورة المتعلقة بها بين الاطفال حديثي الولادة في مدينة الموصل .

**منهجية البحث** دراسة مقطعية أجريت على 440 طفل حديثي الولادة في مستشفى الخنساء للولادة والأطفال ومستشفى ابن سينا التعليمي في وحدة العناية المركزة للأطفال حديثي الولادة ، تم إجراء الدراسة من 28 /كانون الأول 2009 حتى نهاية 28 /نيسان 2010 .جمعت المعلومات عن طريق الأبوين من خلال استمارة المعلومات المتعلقة بالمرض،  وتم إجراء الفحص ألمختبري لمعرفة مستوى البليروبين .

**النتائج:** (66%)        ( 34%)        (2.674) كغم ،

بلغ معدل مستوى البليروبين 13.67    /ديسليتر

**الاستنتاج:** استنتجت الدراسة أن ارتفاع المادة الصفراء من أكثر الإمراض التي يتعرض لها الأطفال بعد الولادة في مدينة الموصل للإصابة من الإناث ، وتبين أن أمهات الأطفال ذوات المستوى الثقافي المتدني هم الأكثر عرضة لإصابة أطفالهن، ولقد تبين أن العامل الوراثي يلعب دورا مهما في هذا المرض ، وأن قلة الرضاعة هي احد عوامل الخطورة التي تزيد من شدة المرض، كما ظهر أن أمهات الأطفال فوق 25        هم أكثر عرضة لإصابة أطفالهن بهذا المرض.

**التوصيات:** يوصي الباحث بعمل تحري للمرض في الثلاثة أيام الأولى من بعد الولادة من قبل الممرض، ودعم الأبوين بالمعلومات حول طريقة العلاج ومضاعفات المرض وكذلك وضع برنامج تثقيفي للكادر التمريضي لمعرفة التعامل مع هذا المرض ونصح المقبلين للزواج Rh.

**Abstract**

**Background**: Hyperbilirubinemia is one of the most common problems encountered by neonatal infants

**Objectives**:

1-To identify an incidence of hyperbilirubinemia in neonatal in Mosul city

2-To determine the risk factors which may associated with hyperbilirubinemia.

**Methodology**:

A descriptive study was conducted on 440 neonates attending the Al-Khansaa Teaching Hospital and Ibin-Sena Teaching Hospital in neonatal intensive care units. The study aimed to identify the prevalence of hyperbilirubinemia among neonates and to determine the associated risk factors for hyperbilirubinemia in Mosul city, through out 28th December 2009 to the end of 28th April 2010.

**Results**: The study revealed that the (35%) of neonates with hyperbilirubinemia , male neonates were (66% ), while (34%) were female, the mean birth weight was (2.674) kg., the mean peak bilirubin level was ( 13.67) mg/dL,

**Conclusion**: Hyperbilirubinemia is one of the most common problems encountered by the neonatal infants in Mosul city, the male gender showed more effected than female for the development of hyperbilirubinemia, neonates of mothers with low educational level are more effected by hyperbilirubinemia than good education, positive family history of jaundice in sibling had higher significant risk for hyperbilirubinemia than those with negative history, poor feeding had significant risk for hyperbilirubinemia than jaundiced neonates with good feeding, maternal age > 25 years had a significant relationship between mother age and neonates with hyperbilirubinemia.

**Recommendation**: Screening for hyperbilirubinemia in 1st three days of life by nurses , provide parents with information about treatment and complication, education and training the nursing staff about hyperbilirubinemia and encouraging the women and men to have pre-marital test for Rh factor.

**Keywords:** Incidence, Risk Factors, Hyperbilirubinemia, Neonatal

## INTRODUCTION

Hyperbilirubinemia is one of the most common problems encountered by neonatal infants. It is the most common condition requiring medical attention in newborns [1].

Jaundice is the clinical manifestation of hyperbilirubinemia, it is relatively common in newborns, where some degree of hyperbilirubinemia is virtually universal. The appearance of jaundice beyond the immediate neonatal delivery is virtually always a manifestation of pathology [2].

The incidence of severe hyperbilirubinemia and kernicterus is also higher among newborn Asian infants. These findings suggest that genetic factors may be involved in the development of severe neonatal hyperbilirubinemia, approximately 60% of term newborns develop jaundice, 2% reach TSB level > 20 mg/dl [3].

The word jaundice comes from the French word jaune, which means yellow [4]. Neonatal jaundice is a condition marked by high levels of bilirubin in the blood. The increased bilirubin causes the infant's skin and whiteness of the eyes (sclera) to looks yellow [5].

Neonatal jaundice affects 60% of full-term infants and 80% of preterm infants in the first week after birth. Neonatal hyperbilirubinemia is the most common reason for hospital readmission in the first two weeks of life, Prolonged neonatal jaundice (after 14 days of age) may be an indication of an underlying liver disorder [6].

The American Academy of Pediatrics (AAP) Practice Guidelines for management of hyperbilirubinemia in the healthy newborn provides guidelines for identifying risk in newborns and treatment strategies, and recommends evaluating the bilirubin level in newborns according to hour-specific bilirubin nomograms, recommends examining the TSB level in every newborn infant every 8–12 hours , and follow-up for all newborns within 48 hrs after discharge by a nurse [7].

The National Association of Neonatal Nurses (NANN) believes that neonatal nurses must be proactive in the assessment and management of hyperbilirubinemia in the newborn, and that parents should be educated about the risks of untreated hyperbilirubinemia, need for close follow-up of their infants after discharge, and further believes that neonatal nurses must take steps to increase awareness and identify strategies within their institutions and practice to enhance the processes of diagnosis and management of hyperbilirubinemia [8].

Nurses play an integral role in the implementation of universal screening for elevated bilirubin levels in the newborn. They should assess the family's level of understanding and discourage behaviors that are not recommended or could actually cause the bilirubin level to rise, such as the administration of supplemental water [9].

## OBJECTIVE:

1-To identify an incidence of hyperbilirubinemia in  neonatal in Mosul city
2-To determine the risk factors which may associated  with hyperbilirubinemia.

## METHODOLOGY

Descriptive study was adopted to achieve the aim of the study, extending from 28th December 2009 to 28th April 2010.

Purposive sample consists of (440) admitted to two hospitals The study sample includes neonatal infants with age under one month of life .The study includes patients in neonatal intensive care unit only .

The study has been conducted by using information sheet which consists of the following criteria :

1. Demographical data including :- age, gender, educational level of mother, maternal age and gestational age.
2. Information related to child which are: weight at birth and type of feeding, age of jaundiced neonates on appearance of jaundiced, state of feeding.
3. Hemolytic factors and family history.
4. Total Serum Bilirubin (TSB) and Blood type ( ABO-Rh) test, The investigation was carried out in the laboratories of Al-Khansaa Teaching Hospital and Ibin-Sena teaching Hospital.

To ensure the validity of the tool, method of procedure proposed to be carried out during the study, experts were chosen to evaluate the proposed plan of the study , therefore, the researcher exposed the instrument to (10) of specialized experts in different fields of sciences.The study tool was composed of two parts the health history sheet which consists of demographical characteristics and risk factors which was constant and couldn't be carried out, while the other part – the laboratory investigation depends on the scheduled procedures, so misstate can occur and the result can vary, therefore, check and re-check in followed days, should be carried on by the same scheduled procedure, the same device so ten neonates admitted to the neonatal intensive care unit were selected for check and recheck in the second day. This procedure lasted for twenty days. The results were indicated for the check –recheck exams for all patients while excluded from the study.

Data were collected through the use of information sheet and the interview with parents of the patient, the study has been conducted at period from 28th December 2009 to 28th April 2010.The data were analyzed statistically by using computerized SPSS system [(10)]. to determine :

1- Chi-square test, which was carried out to measure the relative importance of various variables.
2- Descriptive statistic :- Frequencies, Percentage, Standard deviation and Means
3- Logistical regression (stepwise regression)

# RESULTS

**Table (1) Demographic characteristics of the whole study**

| Variable | Hyperbilirubinemia | | Total |
|---|---|---|---|
| | positive | negative | |
| **Gender** | | | |
| Male | 102 | 131 | 233 |
| Female | 52 | 155 | 207 |
| Total | 154 | 286 | 440 |
| **Mothers age** | | | |
| <25 years | 58 | 168 | 226 |
| 25-35 years | 87 | 92 | 179 |
| >35 years | 9 | 26 | 35 |
| Total | 154 | 286 | 440 |
| **Residence** | | | |
| Urban | 98 | 118 | 216 |
| Rural | 56 | 168 | 224 |
| Total | 154 | 286 | 440 |
| **Education level (mothers)** | | | |
| Not read and write | 67 | 157 | 224 |
| Primary school | 36 | 69 | 105 |
| Secondary school | 21 | 20 | 41 |
| Intermediate school | 14 | 20 | 34 |
| Institutes and university | 16 | 20 | 36 |
| Total | 154 | 286 | 440 |

Table (1) shows demographic characteristics of the whole study which included Gender, Mothers age, Residence and Education level (mothers)
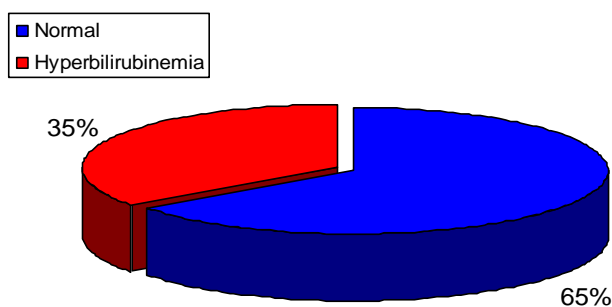


**Figure (1) Shows the incidence of hyperbilirubinemia among neonates in Mosul city is very severe problem.**

**Table (2) Shows mean ± SD of total serum bilirubin (TSB) and body weight at birth.**

| Variables | MEAN± SD |
|-----------|----------|
| TSB level mg/dl | Mean = 13.67<br>SD = 4.801<br>Range 5 - 25 |
| Weight / kg. | Mean = 2.674<br>SD = 570.35<br>Range 1.750 - 4.800 |

Table (2) shows mean ± SD of total serum bilirubin level mg/dl (TSB) (range 5-25) and body weight at birth (range 1.750 - 4.800).
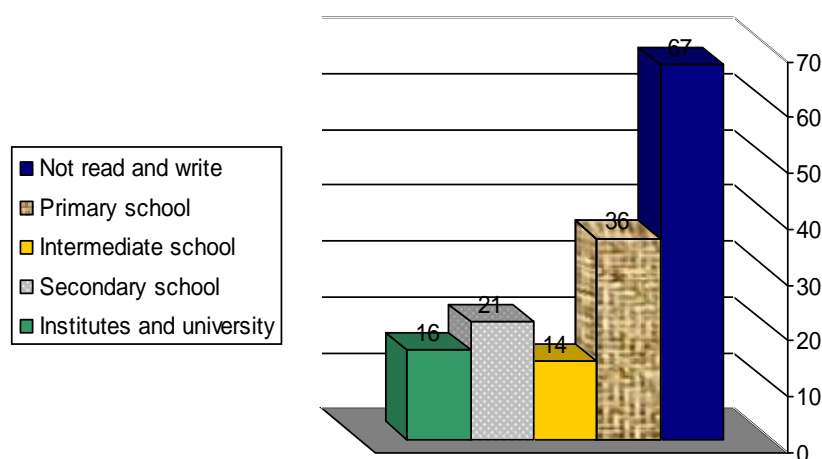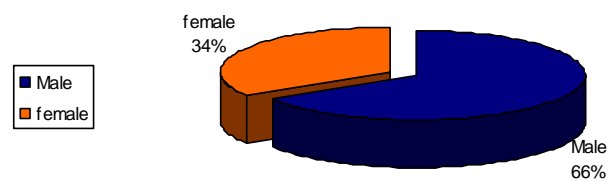


**Figure (2) Distribution of educational levels for neonates mothers with hyperbilirubinemia**.
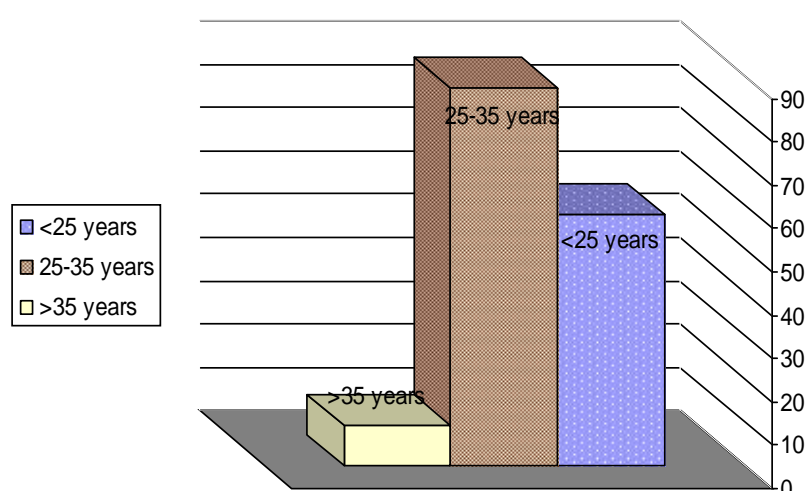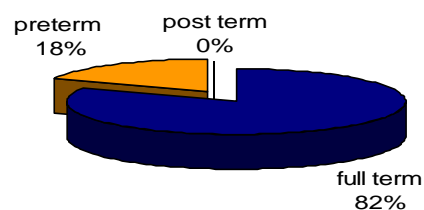


**Figure (3) Distribution of age neonates mothers with hyperbilirubinemia**.
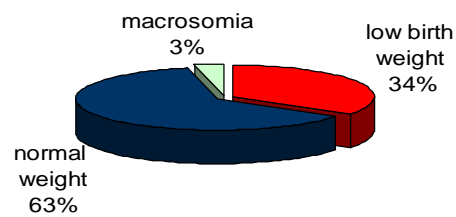
**Figure (4) Shows the percentage of weight at birth among 154 neonates with hyperbilirubinemia .**



**Figure (5) Distribution of gender among 154 neonates with hyperbilirubinemia.**



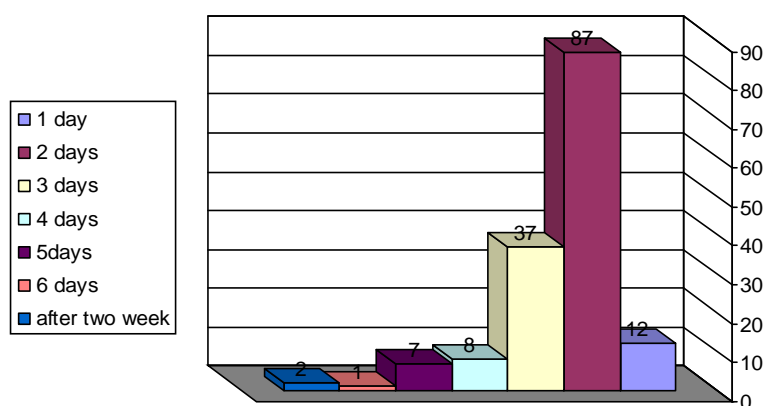**Figure (6) Shows gestation age of neonates mothers.**

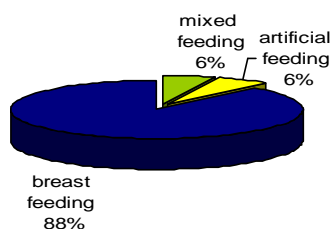**Figure (7) Distribution of Age of jaundiced neonates on appearance of jaundice .**



**Figure (8) Shows the  percentage of feeding method among  154 neonates with hyperbilirubinemia** .
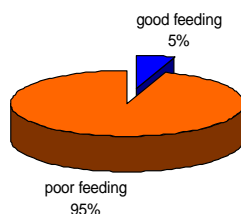


**Figure (9) Shows the  percentage of state of feeding among  154 neonates with hyperbilirubinemia .**
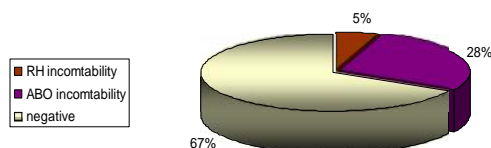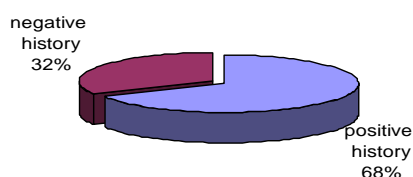


**Figure (10) Shows the  percentage of blood group and  Rh incompatibility  among 154 neonates with hyperbilirubinemia .**

**Figure (11) Shows the percentage history of jaundice in sibling among 154 neonates with hyperbilirubinemia.**

**Table (3) Stepwise regression of hyperbilirubinemia with variables of sample study.**

| Variables | R-sq. | P-value |
|---|---|---|
| **Positive family history** | 0.093 | 0.000 |
| **Breast feeding** | 0.185 | 0.000 |
| **Male gender** | 0.196 | 0.000 |
| **Not read and write** | 0.209 | 0.005 |
| **25-35 years (mothers age)** | 0.221 | 0.008 |
| **Poor feeding** | 0.230 | 0.024 |
| **D.F = 12** | | |

**D.F : Degree of freedom       R-sq. : Regression square**

This table shows that the six significant factors were identical positive family history, breast feeding, male gender, not read and write, 25-35 years (mothers age), poor feeding, P-value less than 0.05 . considered as statistically significant.

## DISCUSSIONS :

Little is known about the incidence of neonatal hyperbilirubinemia in Iraq, however in comparison to other studies. The incidence of hyperbilirubinemia among our study was 35%. Figure (1), in our results is higher than the study that carried out in Iran by Kavehmanesh et al, (2008)[11] in which the prevalence of hyperbilirubinemia was 12.6%. These differences may be attributed to ethnic and geographic variations in different populations [12]. In this study, the mean and (SD) peak bilirubin level were 13.67 ± (4.80) mg/dL, (Table 2), as compared to study [11], in which the mean ± (SD) peak bilirubin level were 17.9 (3.7) mg/dL. The study shows that the percentage is high in normal birth weight of neonates (63%), while it was (34%) with low birth at weight and (3%) with macrosomia, (figure 4). The mean birth weight was (2.674) kg. (Table 2), is comparable to Bahat and Rao study (2008), which was (2.949) kg. [13]. The results show that the male neonates had highly significant risk for hyperbilirubinemia than jaundiced female neonates,P.value=(0.000),(Table 3).The results show high percentage Jaundiced male neonates were 102 neonates 66% of all positive neonates, Jaundiced female neonates were 52 neonates 34% of all positive neonates).( Figure 5).

This study reported male sex in (66%) of cases, similar to Donal study in UK and Ireland, which showed (60.4%) of cases with severe jaundice were males, This fact may be related to that G6PD deficiency is more common and more severe in male [14].

The results of the study shows significant relationship between educational level and hyperbilirubinemia P.value = (0.005).(Table 3), the result indicated that the high proportion of the sample is not read and write was 67 .(figure 2).

Anthony and Barbara (2007)[15] mentioned that poor education of parents, illiteracy, false thoughts of the community regarding management of neonatal jaundice through exposing the infant to neon lights in their homes may be due to bad situation. All these factors can lead to this late presentation of those neonates to hospital.Lack of family concern about jaundice may be related to poor family education about jaundice complications, wrong idea of benign jaundice course and management by non scientific ways

The results show that there is a significant differences between mother age and neonates with hyperbilirubinemia, P.value = (0.008) Figure (3) Table (3). Other studies mentioned that maternal age between 25-35 years is one of minor risk factors for development of Hyperbilirubinemia in neonates [16].

The study shows that term neonates with hyperbilirubimemia had higher percentage (82%) than preterm (18%) of neonates. Figure (6).

Henry Ford Health System (HFHS) , which reported that severe jaundice was associated with younger gestational age which had a higher significant risk in term jaundiced neonates which could be explained by most of jaundiced neonates in this study. Preterm neonates are more likely to have hospital admission due to other causes than jaundice e.g, sepsis. There is an increase concern about jaundice in preterm by family and physician because of the presence of risk factors of severe jaundice and increase risk of other diseases (infections, dehydration, poor feeding… etc.)[17].

Figure (7) shows that jaundiced neonates with appearance of jaundice in the first three days of life had higher than after third day of life.

Jaundice in 1st three days of life was more likely to be pathological (e.g. hemolytic diseases more likely to be presented in first three days of life and even intrauterine) , so that jaundice that is visible during the first 24 hours of life is likely to be nonphysiologic [18]. The study shows high significance with P.value = (0.000). Table (3), breast feeding was identified in (88%) of cases (Figure 8), while Donal study identified that (80.5%) of cases were breast feeding [14]. Poor breast feeding that leads to significant dehydration and weight loss can increase total serum bilirubin [19] . Poor feeding (with or without lethargy) increases risk of severe jaundice because of poor energy supply, dehydration, delayed passage of meconium and increase of entero-hepatic circulation [20]. Our study shows that poor feeding had significant risk for hyperbilirubinemia, P.value = (0.024). Figure (9) Table (3). Infants with ABO or Rh incompatibilities may develop severe hyperbilirubinemia within the first 24 hours after birth. Increased hemolysis results from maternal antibodies reacting with fetal and neonatal antigens. Rh incompatibilities may occur when the infant is Rh positive and the mother is Rh negative. ABO incompatibilities may occur when the infant has type A or B blood, and the mother has type O [3]. According to our results, (28%) suffered from ABO incomtability and 5% Rh incomtability, (Figure 10), while in Mahmood study (26%) of studied cases suffered from ABO incomtability and 11% Rh incomtability [21]. Positive family history of jaundice in sibling had a higher significant risk for hyperbilirubinemia than those with negative history, P.value = (0.000), Figure

(11) (Table 3). That could be explained by: Hemolytic diseases had inherited pattern G6PD deficiency . Incidence is also higher in infants with mutations in the gene that causes Gilbert syndrome, infants with homozygous or heterozygous G-6-PD deficiency and other hereditary hemolytic anemia [7].

## CONCLUSIONS
1- Hyperbilirubinemia is one of the most common problems encountered by the neonatal infants in Mosul city .
2- The male gender showed more effected than female for the development of hyperbilirubinemia.
3- Neonates of mothers with low educational level are more affected by hyperbilirubinemia than good education .
4- Neonatal infants with risk factors (positive family history, breast feeding, male gender, low educational level, maternal age between 25-35 years and poor feeding) are more exposed to hyperbilirubinemia

## RECOMMENDATIONS
1- Screening for jaundice in 1st three days of life by: Clinical assessment for appearance and severity of jaundice by nurses.
2- Evaluation of risk factors before discharge.
3- Infants with risk factors should be  discharged after 72hrs. of delivery.
4- Nurses should advise mothers to breast feeding infants at least 8 to 12 times per day for the first several days.
5- Provide parents with information about signs and symptoms of hyperbilirubinemia severity, treatment, complications .
6- Education and training  the nursing staff  about hyperbilirubinemia .
7- Encouraging the women and men to have pre-marital test for Rh.

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