

RISK FACTORS FOR KERNICTERUS IN NEONATAL JAUNDICE

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ABSTRACT

Background: Kernicterus is a neurologic syndrome resulting from deposition of unconjugated bilirubin in the basal ganglia and brain stem nuclei. The aim of this study was to identify the risk factors for kernicterus in neonatal jaundice.

Material & Methods: It was a cross-sectional study carried out at the neonatal intensive care unit of National Institute of Child Health, Karachi, from 27th September, 2006 to 26th September, 2007. One hundred diagnosed cases of kernicterus were included. Procedure was explained to the parents and informed consent was taken. Neonates with congenital anomalies of central nervous system and meningitis were excluded.

Results: Out of 100 cases 62 were males and 38 females. Age range was 1-15 days. Out of these, 56 were in range of 1-5 days. Prematurity was seen in 39. Fifty-five neonates were of low birth weight. Hypothermia was seen in 44. Home delivery was conducted in 60 cases. Haemolysis was seen in 30 and sepsis in 52. Mean for bilirubin was 27.4 with range 14.5-48.4mg/dl.

Conclusion: Majority of patients with kernicterus are delivered at home and present in late stage. Infection, prematurity and low birth weight are common risk factors.

Key words: Kernicterus, Neonatal jaundice, Risk factors.

INTRODUCTION

Kernicterus is a neurologic syndrome resulting from the deposition of unconjugated bilirubin in the basal ganglia and brain stem nuclei. By pathological criteria kernicterus will develop in one third of infants with untreated hemolytic disease and bilirubin level in excess of 25-30mg/dl. Incidence in hyperbilirubinemic premature infants is 2-16%. Overt neurologic signs have a grave prognosis; 75% or more of such infants die, and 80% of affected survivors have bilateral choreoathetosis with involuntary muscle spasm.¹

Bilirubin is the final product of heme degradation. At physiologic PH, bilirubin is insoluble in plasma and requires protein binding, and after conjugation in the liver it is excreted in bile.² Neonatal jaundice remains the most common problem in this age group, affecting approximately half of term and two third of the preterm babies.¹ Jaundice typically results from the deposition of unconjugated bilirubin in the skin and mucous membranes, defined as a total serum bilirubin level above 5 mg/dl.³

Severe hyperbilirubinemia defined as total serum bilirubin above the percentile of age in hours (high risk zone) occurs in 8-9% of infants during the first week, with approximately 4% affected after 72 hours. Early onset hyperbilirubinemia is a high risk condition. The aetiology in the majority of these cases is hemolysis from ABO incompatibility, although this might not always be confirmed.⁴

Hyperbilirubinemia in preterm infants is more prevalent and severe, and its course is more protracted than in full term neonates.⁵

The increase in reports of kernicterus re-emergence in the past decade in babies otherwise born healthy and discharged from United States hospitals represents a crisis of credibility. As pediatricians, committed to reducing infant mortality and morbidity, we bear an immense responsibility to the society, when we discharge a new born infant to home after birth.⁶

Root causes of identified cases of kernicterus are early discharge with no follow-up, failure to check bilirubin level in the infant noticed to have jaundice within 24 hours, failure to re-

cognize the presence of risk factors for hyperbilirubinemia.⁷

All healthy newborns are at potential risk if their jaundice is unmonitored or managed inappropriately. There is a need to address the social demand for patient safety and to respond to calls for a public health policy to better manage by identifying risk factors for severe hyperbilirubinemia prior to discharge, lactation support to ensure optimal feeding, and parents education for hyperbilirubinemia and keeping follow-up appointments.^{8,9}

The aim of this study was to identify the risk factors for kernicterus in neonatal jaundice.

MATERIAL AND METHODS

It was a cross-sectional study carried out in the neonatal intensive care unit of National Institute of Child Health, Karachi, from 27th September, 2006 to 26th September, 2007.

One hundred clinically diagnosed cases of kernicterus were studied. The sampling technique was purposive.

Neonates presenting with signs and symptoms of kernicterus including poor sucking, stupor, hypotonia /hypertonia, seizure, opisthotonos, retrocollis were included in study. While those with congenital anomalies of central nervous systems or history of meningitis were excluded.

The purpose and procedure of the study were explained to the parents and informed consent was taken. History and clinical examination was performed along with investigations. All the data was collected on proforma.

Data was entered in computer by using SPSS version 10.0. Frequency and percentages were computed to present all categorical variables including sex, place of delivery, haemolysis, sepsis, prematurity and hypothermia. Mean with standard deviation was computed for age and birth weight of patient. Chi-square test of proportions was applied to check proportion difference for home delivery, sepsis, haemolysis, prematurity and hypothermia at p <0.05 level of significance.

RESULTS

Total 100 neonates presenting with signs and symptoms of kernicterus were included in this study. Out of them 62 (62%) were males and 38 (38%) females. The age range was 1-15 days with Mean age of 5.5±2.8 days.

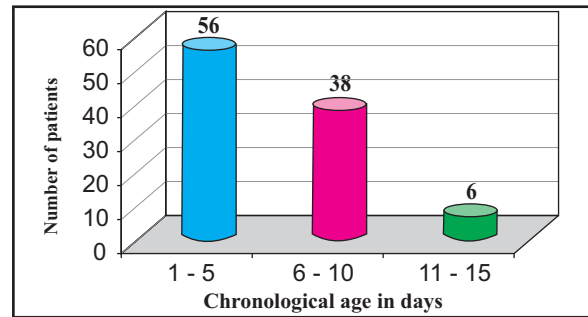


Fig. 1: Distribution of patients according to the chronological age. (n = 100)

The various risk factors involved are given in Table 1 below.

Table 1: Risk factors involved. (n = 100)

Risk Factors	Outcomes	Number of Patients
Birth Weight	Normal	45
	Low	55
Hypothermia	Yes	44
	No	56
Haemolysis	Yes	30
	No	70
Sepsis	Yes	52
	No	48
Place of Delivery	Hospital	47
	Home	53
Gestational Age	Term	61
	Pre-term	39

Distribution of number of various risk factors is presented in Table 2. Three risk factors were seen in 30 (30%) patients, this was significantly high (p<0.001), while 2 risk factors were seen in 26 (26%) patients, 4 in 21 (21%) patients and one risk factor in 16 (16%) patients.

Table 2: Number of risk factors involved. (n = 100)

Risk Factors involved	Number of Patients (%)
No Risk Factors	1 (1)
One Risk Factor	16 (16)
Two Risk Factors	26 (26)
Three Risk Factors	30 (30)*
Four Risk Factors	21 (21)
Five Risk Factors	5 (5)
Six Risk Factors	1 (1)

*p<0.001 Highly significant

DISCUSSION

The objective of our study was to identify the risk factors for kernicterus in neonatal jaundice, which would help in the early diagnosis and prevention of kernicterus.

Kernicterus is most serious complications of neonatal jaundice. If it is not treated vigorously, 75% of the affected neonates die and 80% of survivors get neurological sequelae and handicaps. The exact incidence of kernicterus is not known in Pakistan. Out of hundred neonates 62% were males and 38% females with a ratio of 1.6:1. This male sex dominance is due to increased risk of neonatal jaundice in male sex³ and probably due to parents concern about male babies in our social setup. Among infants reported in the US kernicterus registry, 67% of the patients were males.

Home delivery was found to be a major risk factor contributing to the development of kernicterus in our study. Out of hundred cases of kernicterus 60% deliveries were conducted at home without aseptic measures. These neonates presented late and required emergency exchange transfusions. Sepsis was common in these neonates as a contributing factor. This is supported by an Indian study regarding the risk factors for kernicterus in which 93% babies are delivered at home.¹⁰

American Academy of Pediatrics (AAP) subcommittee on hyperbilirubinemia and kernicterus¹¹ also mentioned the root causes of kernicterus as lack of follow up, failure to recognize risk factors, delay in measuring serum bilirubin level in jaundiced patients and lack of concern regarding the jaundice. This was best explained in deliveries conducted at home without knowing the risk factors in these babies.

Prematurity and low birth weight was the second common risk factor observed in our study. Bhutani VK and Lois Johnson⁸ in their study stated that prematurity is a significant risk factor for hyperbilirubinemia and is known to be a basis for increased biologic vulnerability to risk of bilirubin induced neurotoxicity. Other significant risk factor documented in this study was sepsis. It was found in 52% cases. This is explainable because majority of neonates were preterm, low birth weight and home delivery.

Mubarak Ali¹² in his study of 50 cases of significant hyperbilirubinemia also found sepsis as the second most common cause.

Next significant risk factor was haemolysis, seen in 30% of patients. This is comparable with the study of Mubarak Ali¹² who ob-

served haemolysis in 28% of patients of significant hyperbilirubinemia. We observed in our study that majority of neonates having haemolysis as a risk factor for kernicterus were delivered at home and presented in a late stage.

CONCLUSION

Majority of patients with kernicterus are delivered at home and present in late stage. Other risk factors involved are Infection, prematurity and low birth weight. This reflects poor antenatal care, lack of parental awareness and false belief that jaundice will resolve on its own, exposure to sunlight or visiting faith healers.

Clinicians need a systematic approach to identify the infants who may develop severe hyperbilirubinemia and keep them in follow-up.

Health care providers working with neonates play a key role in identifying and assessing neonates at risk for pathologic jaundice. Parents counseling is required for bringing their babies early to prevent kernicterus.

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