www.jmscr.igmpublication.org Impact Factor 3.79
ISSN (e)-2347-176x

IGM Publication Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

An Estimation of Hospital Based Incidence of Neonatal Hyperbilirubinemia in Term Newborns and Associated Risk Factors in a North Indian Setting

Authors
Dr. Anil Kumar[1], Dr Mohd. Parvez[2], Dr Nasir Ansari[3], Dr Swatantra Kumar[4], Dr Pooja Kanodia[5]
[1, 2, 3]Assistant Professor, Department of Pediatrics, Integral Institute of Medical Sciences, Lucknow
Email: *pediaanil@gmail.com parvezmohd3181@gmail.com gtbnasir@yahoo.co.in*
[4]Professor, Department of Pediatrics, Integral Institute of Medical Sciences, Lucknow
Email: *kumar.swatantra15@gmail.com*
[5]Senior Resident, Department of Opthalmology, Integral Institute of Medical Sciences, Lucknow
Email: *nishantpooja@rediffmail.com*
Corresponding Author
Dr. Anil Kumar
Assistant Professor, Department of Pediatrics, Integral Institute of Medical Sciences, Lucknow
Email: *pediaanil@gmail.com*

Abstract
Objective: *To estimate the incidence of neonatal hyperbilirubinemia in newborns and associated risk factors.*
Study design: *Prospective cross-sectional study.*
Study site: *Department of Pediatrics, Integral Institute of Medical Sciences, Lucknow, UP.*
Study subjects: *244 healthy full-term newborns with gestational age ≥37 and ≤42 weeks with birth weight of ≥2.5 kgs born in this hospital.*
Results: *Male-134 (54.9%) and female-110 (45.1%)] were included in the study. Mean birth weight was 2.76 (±0.16) kg. Nearly half (48.8%) of the newborns had ABORh B+. The neonatal hyperbilirubinemia was observed in 56 (23%) newborns. The incidence was higher in males (28.4%) than in females (16.4%). The incidence of neonatal hyperbilirubinemia was significantly higher in those newborns whose mother's gestational age was <38 weeks (62.5%) as compared to those whose gestational age was >=38 weeks (17%) and this was statistically significant (p=0.0001). The presence of anemia in mothers was significantly associated with the neonatal hyperbilirubinemia. The risk was higher in those neonates who had history of hyperbilirubinemia in sibling.*
Conclusions: *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 acute bilirubrubin encephalopathy and subsequent kernicterus.*
Key words: *Incidence, Full-term newborns, Neonatal hyperbilirubinemia, risk factors.*

INTRODUCTION

Neonatal jaundice is the occurrence of elevated bilirubin levels in the blood. It may be physiological or pathological. If the concentration of non-conjugated bilirubin in the blood is too high, it breaches the blood brain barrier and bilirubin encephalopathy occurs with serious consequences for the child[1]. The etiology and risk factors for indirect neonatal hyperbilirubinemia is varied and multifactorial. A study done in Australia revealed that the incidence of severe neonatal jaundice was between 7.1 and 45 per 100,000 births and of kernicterus at 0.4-2.7. The causes and risk factors associated were ABO and other blood group incompatibilities, glucose-6-phoshate-dehydrogenase deficiency, infections, prematurity, male gender, ethnicity, breastfeeding and early hospital discharge[2] (McGillivray and Evans, 2012).

In India, healthy neonates are usually discharged within 24-48 hrs after a normal delivery. Due to continuing rise of bilirubin and absence of supervision for ensuring optimal feeding, neonates discharged home before completing 48-72 hrs of age are at high risk of developing undetected significant jaundice[3] (Guruprasad et al, 2005). Physiological range of indirect bilirubin in cord blood is 1-3 mg% and rises at a rate of <5mg/dl/24 hr, clinically evident jaundice on 2nd- to 3rd day, peaking on 2nd-4th day at 5-6mg/dl thereafter declining to <2mg/dl on 5th and 7th day . Some 6-7% full term infants have these levels of indirect bilirubin >12.9mg/dl and less than 3% reach levels of>15mg/dl. Risk factors for indirect hyperbilirubinemia include maternal age, race, diabetes, drugs , altitude, oxytocin induction, and in neonates cutaneous bruising and cephalhema-toma, male sex, drugs, delayed bowel movements, breast feeding, weight loss (dehydration and caloric deprivation) and family history of sibling who had physiologic jaundice. Infants without these variables rarely have levels >12mg/dl. Prediction of neonates at risk for developing exaggerated jaundice can be based on hour specific bilirubin levels in the 1st 24-72 hours of life. Level normally reach adult level (1mg/dl) by 10-14 days of life[4].

The present study was planned to estimate the hospital based incidence of neonatal Hyper-bilirubinemia in newborns and associated neonatal & maternal risk factors in a north Indian setting.

MATERIAL AND METHODS

This was a prospective cross-sectional study conducted over a period of 2 years in the Department of Pediatrics, Integral Institute of Medical Sciences, Lucknow after obtaining approval from ethical Committee of the Institute. This hospital caters population from mostly rural area. All healthy full-term newborns gestation age ≥37 weeks and ≤42 weeks with birth weight of ≥2.5 kgs born in this hospital were included in the analysis. Newborn with ABORh factor incompatibility and who later developed significant illness requiring NICU admission were excluded from the study. Simple random sampling was used in selecting the cases.

Blood samples was collected from cord at time of delivery in EDTA vial, and followed up by another sample at 3 days of age (72 hours post natal age) from infant and analyzed for Total Serum billirubin (STB) concentrations measured by Diazo Methods (DMs) in the Department of Pathology of the Institute. The STB≥13mg/dl was considered as neonatal Hyperbilirubinemia. This level supposedly falls in between the upper and lower intermediate risk zone for future development of significant hyperbilirubinemia as per hour based nomogram provided by Bhutani et al.(1999)[5] and Anthony et al. (2007)[4].

Statistical analysis

The data collected was entered in the Microsoft Excel computer program and checked for any inconsistency. The chi-square test was used to compare dichotomous/categorical variables. The relative risk with 95% confidence interval was calculated to assess the risk factors. The p-value<0.05 was considered as significant. All the analysis was carried out using SPSS 15.0 statistical program.

RESULTS

A total of 244 newborns [Male-134 (54.9%), Female-110 (45.1%)] were included in the study. Mean birth weight was 2.76 (±0.16) kg. Nearly half (48.8%) of the newborns had ABORh B+. Majority of the delivery was FTND (72.1%). The 44.3% **o**f the women were primigravida. Oxytocin was used in 41.8% of the deliveries. Pregnancy induced hypertension (PIH) was observed in only 2% of the women. 7.4% neonates had history of hyperbilirubinemia in sibling (Table-1).

Out of 244 newborns, neonatal hyperbilirubinemia was observed in 56 (23%) newborns. The incidence was higher in males (28.4%) than in females (16.4%).

The incidence of neonatal hyperbilirubinemia was significantly higher in those newborns whose gestational age was <38 weeks (62.5%) as compared to those whose gestational age was >=38 weeks (17%) and this was statistically significant (p=0.0001). The incidence was almost 4 times higher in those PIH was present (83.3%) as compared to those in whom PIH was absent (21.4%) (RR=3.89, 95%CI=2.52-5.99, p=0.003). Use of oxytocin, mode of delivery and gravida was not associated with significant risk of neonatal hyperbilirubinemia. However, presence of anemia in mothers was significantly associated with neonatal hyperbilirubinemia. The risk was higher in those neonates who had sibling with history of hyperbilirubinemia (Table-2).

Physiological jaundice was present among 47.1% of the cases and septicemia was found in 21.7%. However, ABO haemolysis was in 16% and Rh haemolysis was observed in 6.6%. The birth injuries was seen in 5.3% (Fig.1).

Table-1: Baseline characteristics of newborns and mothers

Characteristics	**No. (n=244)**	**%**
Newborns		
Male	134	54.9
Female	110	45.1
Birth weight in kg (mean ± sd), range	2.76±0.16, 2.51-3.45	
ABORh		
A+	54	22.1
AB+	41	16.8
B+	119	48.8
O+	30	12.3
Hyperbilirubinemia in sibling	18	7.4
No. of days of discharge (mean ± sd), range	5.34±1.45, 3-9	
Mothers		
Mode of delivery		
Forceps	8	3.3
FTND	176	72.1
LSCS	60	24.6
Gravida		
2^{nd}	93	38.1
Multi	43	17.6
Primi	108	44.3
Use of Oxytocin	102	41.8
Pregnancy induced hypertension (PIH)	6	2.5
Booked		
Booked	106	43.4
Unbooked	138	56.6
Anemia in mother	114	46.7
Gestational age (mean ± sd), range	38.46±0.94, 37-42	

ABORh		
A+	107	43.9
AB+	39	16.0
B+	73	29.9
O+	25	10.2

Table-2: Association between incidence of neonatal hyperbilirubinemia and Mother's characteristics

Characteristics	**No. of newborns**	**3rd day serum bilirubin**				**RR (95%CI), p-value**
		≥13		**<13**		
		No.	**%**	**No.**	**%**	
Mothers						
Gestational age						
<38	32	20	62.5	12	37.5	3.68 (2.47-5.49), 0.0001*
>=38	212	36	17.0	176	83.0	
Pregnancy induced hypertension (PIH)						
Present	6	5	83.3	1	16.7	3.89 (2.52-5.99), 0.003*
Absent	238	51	21.4	187	78.6	
Use of Oxytocin						
Given	102	28	27.5	74	72.5	1.39 (0.88-2.20), 0.15
Not given	142	28	19.7	114	80.3	
Mode of delivery						
Forceps	8	3	37.5	5	62.5	X^2=2.11, p=0.11
FTND	176	41	23.3	135	76.7	
LSCS	60	12	20.0	48	80.0	
Gravida						
2nd	93	22	23.7	71	76.3	X^2=0.38, p=0.67
Multi	43	11	25.6	32	74.4	
Primi	108	23	21.3	85	78.7	
Anemia						
Present	114	39	34.2	75	65.8	2.78 (1.64-4.70), 0.0004*
Absent	130	16	12.3	114	87.7	
Neonatal						
Sex						
Male	134	38	28.4	96	71.6	1.73, (1.05-2.86), 0.02*
Female	110	18	16.4	92	83.6	
History of sibling						
Present	18	8	44.4	10	55.6	2.09 (1.18-3.72), 0.02*
Absent	226	48	21.2	178	78.8	

RR=Relative risk, CI-Confidence interval, *Significant

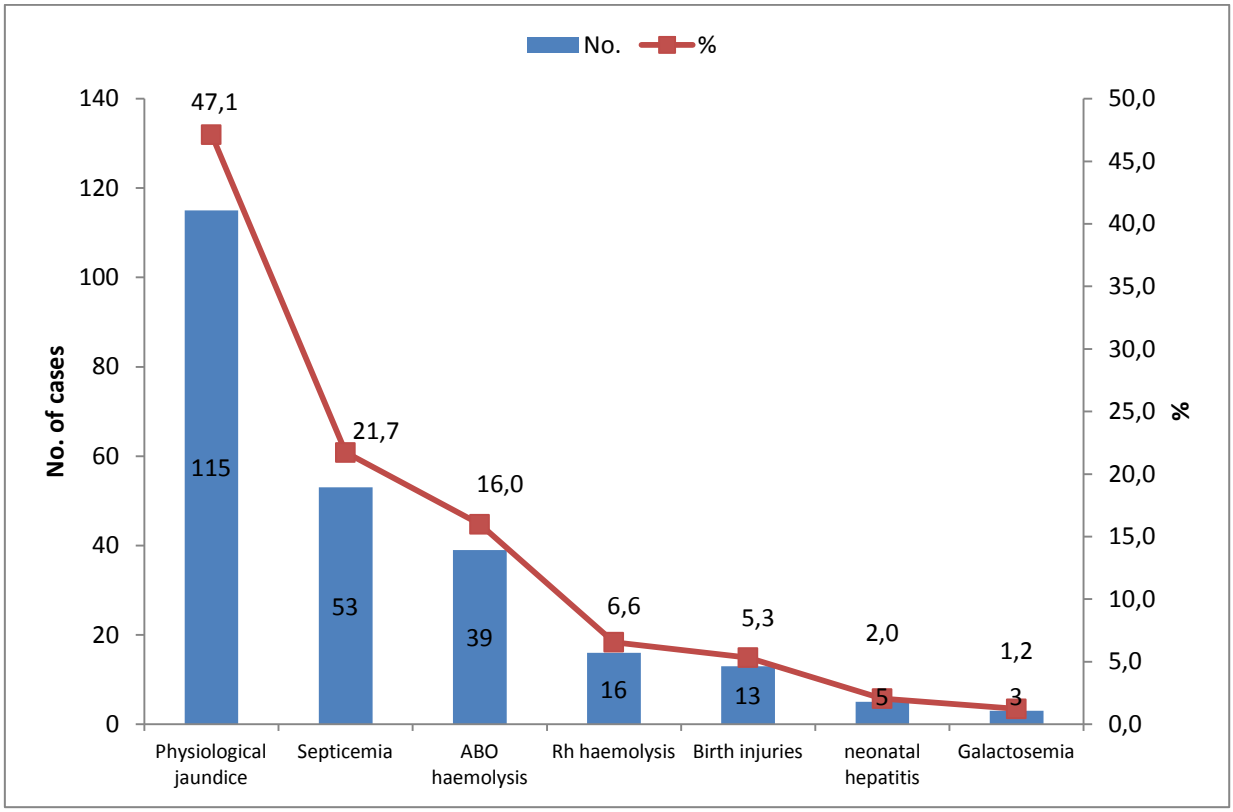

Fig.1: Causative factors

DISCUSSION

The present study estimated the incidence of neonatal hyperbilirubinemia in a hospital setting. The incidence of neonatal hyperbilirubinemia in the present study was 21.4% which is almost similar to the incidence of neonatal hyper-bilirubinemia in a study reporting rates from hospital-born babies in 10 tertiary care intensive care units in India (27.9%)[6]. Male neonates showed a trend towards presenting with jaundice more commonly than female neonates in the present study.

In an effort to promote better care-seeking and referral, WHO and UNICEF developed an Integrated Management of Childhood Illnesses (IMCI) algorithm for children 2–59 months old to guide families and health care workers in resource poor settings[7]. An adaptation of this algorithm to extend it to the neonate and infant <2 months has been evaluated in the Indian population[8]. However, an evaluation of the adapted IMCI algorithm reported that jaundice forms the single most important cause of diagnostic mismatch (between gold standard for diagnosis and algorithm accounting for 47–62% of diagnostic mismatch), particularly in the 0–6 day age group[8]. We did not assess icterus of lower extremities, palms and soles as the data were extracted from the records, this being one of the limitations of the study. Also, we were also not able to test for and identify causes of pathological jaundice in our study population because of resource constraints.

In the present study, some of the maternal characteristics were significantly associated with neonatal hyperbilirubinemia like gestational age, PIH and anemia in mothers. Expecting mothers and Parents should be educated about the consequences of hyperbilirubinemia and advised simple means to prevent it. Exclusive breast feeding without prolonged periods of fasting, and avoidance of supplementation with dextrose or water are some documented measures associated with lower serum bilirubin levels in newborns[9]. A retrospective cohort study assessed the impact of universal bilirubin screening in 358086 infants with a gestational age of 35 weeks or less and birth weight of less than 2 Kgs and concluded that universal bilirubin screening was associated with a significantly lower incidence of severe

hyperbilirubinemia but also with increased phototherapy use[10].

In this study, the incidence of physiological jaundice was 47.1% which was lower than values reported by Narang et al (57.8%)[11] but it was higher than values reported by Singhal et al (34.4%)[12]. Septicemia was present in 21.7% cases in the present study. Bedowra et al[13] reported the incidence of septicemia to be 26.7%. But it was higher than other studies, Singhal et al (5.7%)[12], Narang et al (7.4%)[11], Amar et al (12%)[14], Henny Harry and Trotman (14%)[15] and Choudury et al (17.6%)[16].

ABO incompatibility was present in 16% cases in the present study. It is comparable with Amar et al study (15%)[14] and Singhal et al (14.3%)[12]. But it was higher than Narang et al (6.1%)[11], Bedowra et al (13.3%)[13], Nahla et al (9.7%)[17] and Choudury et al (11.3%)[16].

Clinicians need a systematic approach to identify the infants who may develop severe hyperbilirubinemia and keep them in follow up. The early identification and adequate treatment of children with cholestasis is essential to prevent morbidity and mortality.

CONCLUSION

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 acute bilirubrubin encephalopathy and subsequent kernicterus.

Conflict of interest None
Funding None

REFERENCES

1. Mesić I, Milas V, Medimurec M, Rimar Z. Unconjugated pathological jaundice in newborns. Coll Antropol 2014; 38(1):173-8.
2. McGillivray A, Evans N. Severe neonatal jaundice: is it a rare event in Australia? J Paediatr Child Health 2012; 48(9):801-7.
3. Guruprasad G, Chawla Deepak, Aggarwal Sunil. Management of Neonatal hyper-bilirubinemia. NNF Clinical Practice Guidelines, 2005.
4. Anthony J.Piazza & Barbara J. Stoll in Chapter 102.3 Jaundice and Hyper-bilirubinemia in the Newborn . pp.756-760 in Nelsson's Texbook of Pediatrics 18th Ed. (2007)
5. Bhutani VK, Johnson L, Sivieri EM. Predictive ability of a predischarge hour-specific serum bilirubin for subsequent significant hyperbilirubinemia in healthy term and near-term newborns. Pediatrics 1999;103:6-14.
6. NNPD. Morbidity and mortality among outborn neonates at 10 tertiary care institutions in India during the year 2000. Journal of Tropical Pediatrics, 2004; 50: 170–174.
7. Anonymous. Management of hyper-bilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics, 2004; 114: 297–316.
8. Goswami V, Dutta AK, Singh V and Chandra J. Evaluation of simple clinical signs of illness in young infants (0–2 months) and its correlation with WHO IMCI algorithm (7 days to 2 months). Indian Pediatrics, 2006; 43: 1042–1049.
9. Dennery PA, Seidman DS and Stevenson DK (2001) Neonatal hyperbilirubinemia. New England Journal of Medicine, 2001; 344: 581–590.
10. Kuzniewicz MW, Escobar GJ, Newman TB. Impact of universal bilirubin screening on severe hyperbilirubinemia and phototherapy use. Pediatrics 2009; 124(4):1031-9.
11. Narang A, Gathawala G, Kumar P; Neonatal Jaundice – An analysis of 551 cases Indian Paediatrics 1997, 34: 429 – 432.

12. Singhal P.K., Singh M, Paul V K, Deoradi A.K., Ghorpade M.G., Spectrum of neonatal 13. hyperbilirubinemia - An analysis of 454 cases Indian Paediatrics 1992, 29: 319 – 325.
13. Bedowra Zabeen, Jebun Nahar, N Nabi, A Baki, S Tayyeb, Kishwar Azad, Nazmun Nahar: Risk Factors And Outcome Of Neonatal Jaundice In A Tertiary Hospital. Ibrahim Med. Coll. J. 2010; 4(2): 70-73.
14. Amar Shah, Dr. C K Shah, Dr. Venu Shah et al: Study of Hematological Parameters among Neonates admitted with Neonatal Jaundice. Journal of Evolution of Medical and Dental Sciences- Volume1, Issue3: July-Sept 2012; Page 203–208.
15. Henny - Harry C and Trotman H: Epidemiology of Neonatal Jaundice at the University Hospital of the West Indies 2012.
16. Choudhury, Habibur Rasul, Md Abul Hasan, Farhana Yasmin: Outcome of Neonatal Hyperbilirubinemia in a Tertiary Care Hospital in Bangladesh Malaysian J. Med. Sci. Apr-Jun 2010; 17(2): 40-44.
17. Nahla I. Al-Gabban, Haider Nadhim Abd, Essam Ahmed Abd: Unconjugated Neonatal Hyperbilirubinemia: Evaluation and Treatment. Iraqi J. Comm. Med.: July 2010 (3).