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A study on risk factors associated with neonatal hyperbilirubinemia among newborns at tertiary care level in Kerala, India

Chandramohan Reddy S.¹*, Sam Varghese²

¹Department of Pediatrics, Karuna Medical College, Chittur Palakkad, Kerala, India

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*Correspondence:

Dr. Chandramohan Reddy S.,

E-mail: Chandra81pediatrics@gmail.com

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ABSTRACT

Background: Neonatal hyperbilirubinemia is defined as serum bilirubin levels >7 mg/dl around 85% of all term newborns and most of the premature babies develop clinical jaundice and various associated risk factors are involved in NNH and treatment for this condition depends on gestational age, serum bilirubin levels at different time interval during early life of these newborns and treating them with phototherapy or exchange transfusion. Objective of the study was to establish the relation with the NNH and risk factors among newborns and treatment with the phototherapy if required.

Methods: The present prospective study was conducted at Karuna Medical College, Chittur Palakkad from January 2019 to December 2019. A total of 40 samples which are born during the study period were included in the study. All types of gestations (preterm, full term, post term), both genders (male and female), new-borns with risk factors, serum bilirubin (TSB) >7 mg/dl at 48 hrs of life were included in the study

Results: In our study, female samples consists of 55% and male samples were 45% during the study period minimum gestational age was 35 weeks and maximum was 40 weeks. 5% sample with a serum bilirubin level of 9 mg/dl, with risk factor as a Rh(-ve) incompatibility was treated with phototherapy up to 96 hrs of life.

Conclusions: Study conveys various risk factors responsible for NNH and treatment with phototherapy given to the affected new-borns. With good clinical history, risk factors involved in new-borns, antenatal counseling is needed to all pregnant women's it is necessary to check the serum bilirubin levels and treated with phototherapy to avoid further NNH related complications in the new-borns.

Keywords: Breast feeding, Bilirubin, Clinical history, Phototherapy, Risk factors

INTRODUCTION

Among newborns, Neonatal Hyperbilirubinemia (NNH) is a widespread phenomenon and in the majority cases, it is being observed in early stage of life. This condition will create disorder known as bilirubin encephalopathy causes hearing loss, vision problems and mental retardation among newborns. This can be easily controlled if excessive hyperbilirubinemia for particular age of newborns are promptly identified, monitored and diagnosed with proper medication in time will save health

among newborns in long run.¹ However, it is most essential to monitor newborns for severity levels of bilirubinemia before they get discharged from hospital, which will help in identifying the newborns at risk for increased hyperbilirubinemia especially during the period of first week in the newborns.² Newborns with premature delivery are associated with risk factors related to several neurological and improper growth developments, leading to the children vulnerable to early mortality.³ Countries with high rates of child mortality and under developed growth impacts on progress of countries health care

²Department of Pediatrics, SNIMS, Chalakka, Kunnukara Ernakulam, Kerala, India

sector coupled with availability of food nutrition and child health will be greatest challenging in long run for overall development for the country.⁴ Breast milk is the ultimate food for better growth and development for newborns. Ideally, initiation of breastfeeding must be within one hour of birth and also helps in improve child survival in critical stages.⁵⁻⁷ At present, about 54.9% of newborns are breastfed in India.

Breastfeeding was initiated within one hour in 41.6% of the children in 2018 and it has increased to double digit since the last round of National Family Health Survey (NFHS) was 23.4% in 2017.8 Doumas and Peters in their study conveyed that, in the human body metabolism of bilirubin has very important aspects by hepatic transportation of bilirubin and its clearance only through albumin.9 If conditions where, the low levels of serum albumin level are observed, it will decrease bilirubin clearance and thus will add to the chances of significant hyperbilirubinemia. Hence it can be put forwarded that cord serum albumin levels can predict significant hyperbilirubinemia. Another, study made by Ahire N, et al, conveys that, healthy newborns with risk factors like ABO incompatibility and with Rh (-ve) incompatibility with Cord Blood Bilirubin ≤3mg/dl can help to recognize newborns those are doubtful can be suggested for further evaluation and intervention.¹⁰

The study also suggested that, new born babies with Cord Blood Bilirubin level ≥3mg/dl should be monitored more frequently. Hence, by predicting early at birth, the newborns who can develop significant neonatal jaundice, can be treated with effective phototherapy treatment to prevent further complications related to the neonatal jaundice. And also, we can design and implement the follow-up program in the high-risk groups effectively. 11 At this back drop, the present study aimed to convey the various associated factors between neonatal hyperbilirubinemia (NNH) and phototherapy (PT) and its risk factors arising due to variations observed in different types of pregnancies. The present study was aimed to present rationalized evidence and to endow with track the future research line among young researchers in pediatrics communities.

METHODS

Study was performed at the Karuna medical college, in the Department of Pediatrics. The Intramural delivered, samples required information related to study were collected and analyzed using 40 newborns during 1-year period were prospectively enrolled. The variables such as gestation week was recorded, time of initiation of breast feeding was also taken along with Serum Bilirubin (Total and Direct) estimation was done at various hours of treatment and phototherapy treatment was given for 0 to 5 days of age for newborns and later also treated if required. The data collected was subjected to analysis using SPSS Statistics_22 for drawing meaningful tables and figures.

Inclusion criteria

- Newborns of both sexes(male and female)
- Newborns with clinical icterus on 48 hrs of life
- Newborns (preterm, term, full term) with risk factors and serum bilirubin>7 mg/dl On 48 hrs of life.

Exclusion criteria

- Newborns without clinical icterus on 48 hrs of life
- Newborns with risk factors and serum bilirubin <7 mg/dl on 48 hrs of life.

RESULTS

Table 1 indicates the sample proportion used in the study, the total population was 40 samples (n=40) among which female infants consists of 55% and 45% male samples to the total population. The study was conducted during the year 2019-2020 at Karuna Medical College, Palakkad, Kerala.

Table 1: Distribution of samples in the study.

Infants sex	Frequency	Percent
Female	22	55.0
Male	18	45.0
Total	40	100.0

Table 2: Descriptive statistics of samples.

Particulars	N	Mini.	Maxi.	Mean	Std. Dev.
Gestation week	40	35.0	40.0	38.32	1.1410
Time initiation of breast feeding after birth (in hours)	40	0.5	96.0	7.875	19.3201
Serum bilirubin total (mg/dl)	40	3.1	16.6	8.90	3.0955
Serum bilirubin direct (mg/dl)	40	0.2	0.5	0.34	0.0640

Table 2 indicates the descriptive statistics of samples, the important variables considered for the study were gestation week, time of initiation for breast feeding after

birth among newborns, serum bilirubin consists of both total and direct (mg/dl). The findings revealed that, during the study period the gestation week was found to

be minimum of 35 weeks and maximum was 40 weeks, similarly for time initiation of breast feeding after birth which was estimated in hours, the minimum time was found to be 0.5 hours immediate after birth and maximum was observed for 96 hours after birth for breast feeding. Further, the Serum Bilirubin total (mg/dl) was maximum at 16.6 mg/dl and minimum at 3.1 mg/dl. On the other end, Serum Bilirubin direct (mg/dl) was found to be maximum at 0.5 mg/dl and minimum at 0.2 mg/dl.

Table 3 conveys the results for time initiation of breast feeding after birth, calculated in hours. The findings shows that, time of initiation for breast feeding was found to be highest per cent of samples within one hour (60 minutes) after birth which constitutes around 35% to the total sample population followed by samples within halfan hour (30 minutes) after birth which accounted around 32.5% to the total sample population were the two major findings observed during the study period.

However, breast feeding initiated after birth varied from 1.5 hours to 3 hours were accounted for 17.5 % of total

sample population and 7.5 % samples was observed in case of breast feeding initiated within 48 hours after birth and except that, rest all remaining samples were having very less proportions about 2.5% each were found for more than 24 hours and 96 hours.

Table 3: Time initiation of breast feeding after birth (in hours).

Initiation of breast feeding (in hours)after birth	Frequency	Percent
0.5	13	32.5
1.0	14	35.0
1.5	3	7.5
2.0	3	7.5
3.0	1	2.5
17.0	1	2.5
24.0	1	2.5
48.0	3	7.5
96.0	1	2.5
Total	40	100.0

Table 4: Risk factors identified for treatment of phototherapy.

Identified risk factors in newborns	Hours of phototherapy treated for newborns								
ruentified fisk factors in flewborns	12 hrs	24 hrs	48 hrs	72 hrs	96 hrs	0 hrs	Total		
Cephalo hematoma	0	0	1	0	0	0	1		
Meconium Aspiration Syndrome (MAS)	0	0	0	1	0	0	1		
MSL+MAS (Meconium staining liquor-MSL)	0	1	0	0	0	0	1		
OB incompatibility	1	0	0	0	0	0	1		
Prematurity	0	0	1	0	0	0	1		
Respiratory Distress Syndrome (RDS)	0	0	1	0	0	0	1		
with Rh (-ve) incompatibility	0	0	0	0	1	1	2		
Total	1	1	3	1	1	1	8		

Table 5: Risk factor identified for different levels of serum bilirubin total.

Risk factors	Serum bilirubin total (mg/dl)							Total	
MISK Tactors	6.7	9.0	11.4	11.8	12.3	12.4	16.0	16.6	10tai
Cephalo Hematoma	0	0	0	0	0	1	0	0	1
Meconium Aspiration Syndrome (MAS)	0	0	0	0	0	0	1	0	1
MSL+MAS (Meconium staining liquor-MSL)	0	0	1	0	0	0	0	0	1
OB Incompatability	1	0	0	0	0	0	0	0	1
Prematurity	0	0	0	0	1	0	0	1	2
Respiratory Distress Syndrome (RDS)	0	0	0	1	0	0	0	0	1
with Rh (-VE) Incompatability	0	1	0	0	0	0	0	0	1
Total	1	1	1	1	1	1	1	1	8

During the study it was found that, early initiation of phototherapy was treated to newborns with hyperbilirubinia, as a vital factor for treatment among newborns (Table 4). It was found that, 5 % of samples were identified as risk of factor for Rh (-ve) Incompatibility were the phototherapy treatment was

extended to about 96 hours and in some cases it was found in initial stages such as zero hours. The study also observed that, the risk factors such as Meconium Aspiration Syndrome (MAS) and MSL (Meconium staining liquor-MSL) stands top observed risk factors among newborns in case of phototherapy treatment.

However, among hour basis longest treatment was given for infants suffering from risks such as Cephalo hematoma, Prematurity and Respiratory distress syndrome for duration of 48 hours newborns were treated with phototherapy.

During the study, the findings states that, eight risk factor were identified for Neonatal hyperbilirubinemmia (NNH) with different levels of observations which are presented in the table 5. The study identified prematurity as major risk factor about 5 percent where the bilirubin was found to be 12.3 mg/dl and 16.6mg/dl when compared to total population followed by Cephalo hematoma and Meconium Aspiration Syndrome (MAS) about 2.5% each risk factor found when bilirubin ranges from 12-16.6mg/dl.

Interactions of gestation weeks with different levels of serum bilirubin among newborns are presented in the Figure 1. The findings revealed that, majority of samples fall under 38th and 39th week, medically it is termed as full term of pregnancy with minimum of 7.5mg/dl and maximum of 12mg/dl and minimum 6mg/dl and maximum of 14mg/dl respectively. However, less than 37th week where serum bilirubin levels where ranging from 4mg/dl to 8mg/dl. In case of 40th week bilirubin levels where found to be fluctuating approximately from 4.5mg/dl to 16mg/dl.

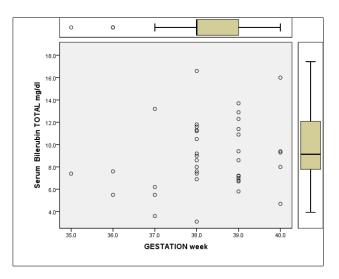


Figure 1: Interactions of gestation weeks with different levels of serum bilirubin among newborns.

The Interactions of risk factors with Different levels of Serum Bilirubin among Newborns are presented in figure 02. The results revealed that, risk factors such as Prematurity, Meconium Aspiration Syndrome (MAS) and Cephalo Hematoma were the three risk factors where Serum Bilirubin was found to ranging from 16.6 mg/dl to 12.4 mg/dl were observed. However, where the Serum Bilirubin was ranging from 9mg/dl to 12.4 mg/dl risk factors such as Respiratory Distress Syndrome (RDS), Meconium staining liquor and Meconium Aspiration Syndrome (MSL+MAS) and Rh (-ve) Incompatibility

were second major risk factors observed during the study and where the Serum Bilirubin level was observed at 6.7mg/dl OB incompatibility risk factor was observed during the study.⁹

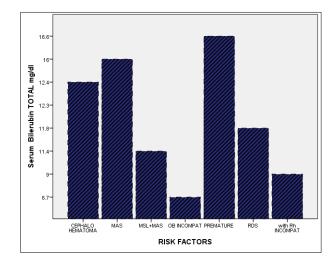


Figure 2: Interactions of risk factors with different levels of serum bilerubin among newborns.

DISCUSSION

The Table 1 clearly indicates that, the total population consisted both male and female infants, however the proportion of female (55%) were more than male (45%) samples when compared to the total population. The study indicates that female infants are more likely to get ill than male infants.

Further, the findings also conveys that, among interactions for variables such as gestation week, Time of initiation for breast feeding after birth among newborns, Serum Bilirubin consists of both total and direct (mg/dl). The findings revealed that, during the study period the gestation week was found to be minimum of 35 weeks and maximum was 40 weeks, similarly for time initiation of breast feeding after birth which was estimated in hours, the minimum time was found to be 0.5 hours immediate after birth and maximum was observed for 96 hours after birth for breast feeding. These findings are closely related to findings observed by Dhirar.⁸

Further, the Serum Bilirubin total (mg/dl) was maximum at 16.6 mg/dl and minimum at 3.1 mg/dl. On the other end, Serum Bilirubin direct (mg/dl) was found to be maximum at 0.5 mg/dl and minimum at 0.2 mg/dl. These findings are associated with Ahire N. The findings related to time of initiation for breast feeding was found to be highest per cent of samples within one hour (60 minutes) after birth which constitutes around 35% to the total sample population followed by samples within halfan hour (30 minutes) after birth which accounted around 32.5% to the total sample population were the two major findings observed during the study period. The findings are closely associated with survey, it says that

breastfeeding was initiated within one hour in 41.6% of the children by Dhirar. 8

The study also states that, newborns were treated with early initiation of phototherapy to hyperbilirubinia condition, as a vital factor for treatment among newborns presented in the Table 4. It was found that, comparatively only 5% of samples were identified as risk of factor for Rh (-ve) Incompatibility were the phototherapy treatment was extended to about 96 hours and in some cases it was found in initial stages such as zero hours when compared with other cases among the study. The reasons behind prolonged treatment of phototherapy were mainly associated with delayed establishment of breast feeding which was prime factor for reducing the neonatal hyperbilirubinia.

The findings states that, eight risk factor were identified for Neonatal hyperbilirubinemmia (NNH) with different levels of observations. Hence the study states that, multiple risk factors leads to increased levels of bilirubin among newborn babies.

Hence, it is very much crucial to prevent the development of risk factors and also to provide advanced care if required, so that we can control and monitor bilirubin levels in these newborns and treat with phototherapy treatment as per the medical protocol. The study says that, majority of samples fall under 38th and 39th week, with a range of 7.5mg/dl to 12mg/dl and minimum 6mg/dl to maximum of 14mg/dl respectively.

The main findings revealed that, the three risk factors risk factors such as Prematurity, Meconium Aspiration Syndrome (MAS) and Cephalo Hematoma were found and observed when the where Serum Bilirubin was found to ranging from (high)16.6 mg/dl to low (12.4) mg/dl were observed.¹¹

CONCLUSION

This study conveys various risk factors responsible for neonatal hyperbilirubinemia (NNH) and treatment with the phototherapy given to the affected newborns. After, obtaining good clinical history, associated risk factors involved in the different types of pregnancies and antenatal care and creating awareness about counseling are needed to all pregnant women's and their caretakers regarding advantages of early initiation of breast feeding, can be anticipate the serum bilirubin levels and treated accordingly to avoid future bilirubin related complications in these newborns.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. Penn AA, Enzmann DR, Hahn JS. Kernicterus in full term infant. Pediatr. 1994 Jun 6;93:1003-6.
- 2. Newman TB, Maisles MJ. Does hyperbilirubinemia damage the brain of healthy full-term infants? Clin Perinatol. 1990;17:1331-5.
- 3. Paul VK, Sachdev HS, Mavalankar D, Ramachandran P, Sankar MJ. Reproductive health, and child health and nutrition in India: meeting the challenge. Lancet. 2011;377:332-49.
- Jain V, Paul VK. Guest editorial: Fetal growth restriction and its consequences. Rev EndocrMetabDisord. 2012;13:83-4.
- 5. WHO (2004) Promoting Proper Feeding for Infants and Young Children. World Health Organization: Geneva. Available at: http://www.who.int/nutrition/topics/infantfeeding/en / Accessed 22 January 2020.
- Lamberti LM, Walker CLF, Noiman A, Victora C, Black RE. Breastfeeding and the risk for diarrhea morbidity and mortality. BMC Pub Health. 2011;11:S15.
- Kornides M, Kitsantas P. Evaluation of breastfeeding promotion, support, and knowledge of benefits on breast feeding outcomes. J Child Health Care. 2013;17:264-73.
- 8. Dhirar N, Dudeja S, Khandekarand J Bachani D. Childhood Morbidity and Mortality in India Analysis of National Family Health Survey (NFHS)-4. Indian Pediatr. 2018;55.
- 9. Doumas BT, Peters T Jr. Serum and urine albumin: A progress report on their measurement and clinical significance. Clin Chem Acta.1997;258:3-20.
- Ahire N, Sonawane R, Gaikwad R, Patil S, Sonawane T. Study of Correlation of Cord Blood Bilirubin with Neonatal Hyperbilirubinemia, MVP. J Med Sci. 2016;3(1):60-6.
- 11. Farhat R, Rajab M. Length of postnatal hospital stay in healthy newborns and rehospitalization following early discharge. N Am J Med Sci. 2011;3(3):146-51.

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