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Neuro Developmental Followup of Neonates with NNH Managed with Exchange Transfusion

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Abstract

An NICU graduate who experiences a stormy neonatal course, Neuro developmental outcome is the key factor which determines the quality of life. There are so many risk factors in NB units will influences the neuro developmental outcome especially with long NICU stay. One of the risk factor for adverse neuro developmental outcome is severe NNH and exchange transfusion. We have done a follow up study of NBs who had undergone exchange transfusion.

Objective: To study the development milestones in neonates managed with exchange transfusion in a tertiary level care hospital.

Methods: 15 newborn babies treated with exchange transfusion were studied retrospectively for a period of 1 year.

Results: All the 15 neonates showed development of milestones at appropriate age. One neonate showed abnormal otoacoustic emission at 3 months which was normal at 6 months.

Conclusion: Standard protocols can be followed in tertiary level care hospital to prevent neonatal complications related to hyperbilirubinemia.

Keywords: Hyperbilirubinemia, Exchange transfusion, Retrospective study

Introduction

Jaundice is one of the commonest findings in the early neonatal period. About 75% of newborn develop Jaundice in first week of life. It is first evident on skin of face, nasolabial folds and tip of nose. As the intensity of Jaundice increases, it progresses in cephalo pedal direction. When soles and palms are distinctly yellow stained, serum bilirubin is usually more than 20mg/dl. Physiological polycythemia and decreased life of red blood cells of fetus result in release of haemoglobin 0.15g/km in a day. 35 mg of bilirubin is released from one gram of haemoglobin. About 20 mg of bilirubin is delivered to liver in healthy form neonate. Due to deficiency of Y and Z acceptor proteins and UDP glucuronyl transferase enzyme in newborn babies, hepatic clearance of bilirubin is decreased. Serum bilirubin measurements are done by conventional Van Den Bergh test in laboratories. When jaundice in newborn does not conform to the time table described for physiological jaundice, it is designated as Pathological. One mole of albumin binds to equimolar amount of bilirubin. 8.5mg of bilirubin is binding with 1 gram of albumin. When bilirubin level exceeds that of albumin in blood, the unbound unconjugated bilirubin level increases, diffuses into blood brain barrier and deposited in neurons of basal ganglia, hippocampus and auditory nuclei producing kernicterus. Among the measures to reduce serum bilirubin standard treatment protocol we follow: Early and frequent Breast feeding for hydration and reduce enterohepatic circulation, IV fluids in needed

NBs, Albumin infusion if required. Standard or intense single or double surface blue light/LED phototherapy, drugs like phenobarbitone and probiotics and exchange blood transfusion. Exchange blood transfusion is the effective and reliable method to reduce bilirubin levels in emergencies like ABO or RH incompatibilities or severe sepsis where phototherapy failed.

Methods:

A retrospective, Descriptive study was carried out in an NICU of tertiary level referral Government Medical College Hospital from October 2019 and October 2021. Clearance from Institutional ethics committee was taken.

Inclusion criteria: Term, neonates who are weight appropriate to age, delivered vaginally or by elective caesarean section without fetal complications.

Exclusion Criteria: Preterm babies, SGA, LGA, Congenital anomalies, Birth Asphyxia.

About 15 neonates with severe NNH failed phototherapy, who fulfilled the inclusion criteria, were selected. All of them had been managed with exchange transfusion for neonatal hyperbilirubinemia as per neonatal protocols. The records were studied up to the age of 1 year. All the 15 babies showed normal apgar scores at birth and followed up by paediatricians of the hospital. The babies developed jaundice during the course of stay and examined clinically. When the abnormal rise of jaundice was observed, serum bilirubin was estimated. The value was compared with recommended parameters. They were given exchange transfusion as the levels were above the critical level appropriate age and weight following standard norms after phototherapy for few hours. After a period of stay of 7-14 days they were discharged with normal physical findings. These children were examined in the outpatient department periodically and developmental milestones were recorded. All cases were subjected to OAE, BERA, neurosonogram, MRI Brain during follow up period. Among the milestones, in this study, four milestones were selected. The new born babies were analysed for the development of milestones within the maximum of range of age for that milestones.

Selected Milestones Chart

Milestone	**Max. Target Age**
Social smile	3 Months
Head Control	6 Months
Sitting without support	9 Months
Standing without support	12 Months
Otoacoustic emissions	3 Months
BERA/USG/MRI Brain	1 year

Results:

Out of the 15 neonatal babies studied, all the 15 babies showed the development of selected milestones within the target age. One neonate showed abnormality in otoacoustic emission at 3 months of age which was again normal at 6 months of age. None had seizures, enamel dysplasia, ocular motility disorders, during the follow-up period

Development of Critical level of Jaundice and age

Age	**No. of Babies**
49 – 72 Hours	4
> 72 Hours	11

Social Smile

Age	**No. of Babies**
9 – 10 weeks	11
11 – 12weeks	4

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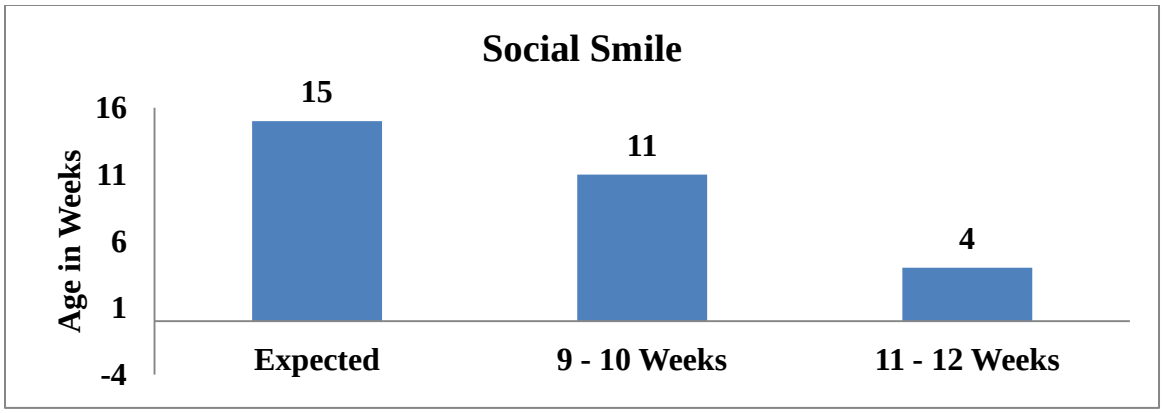
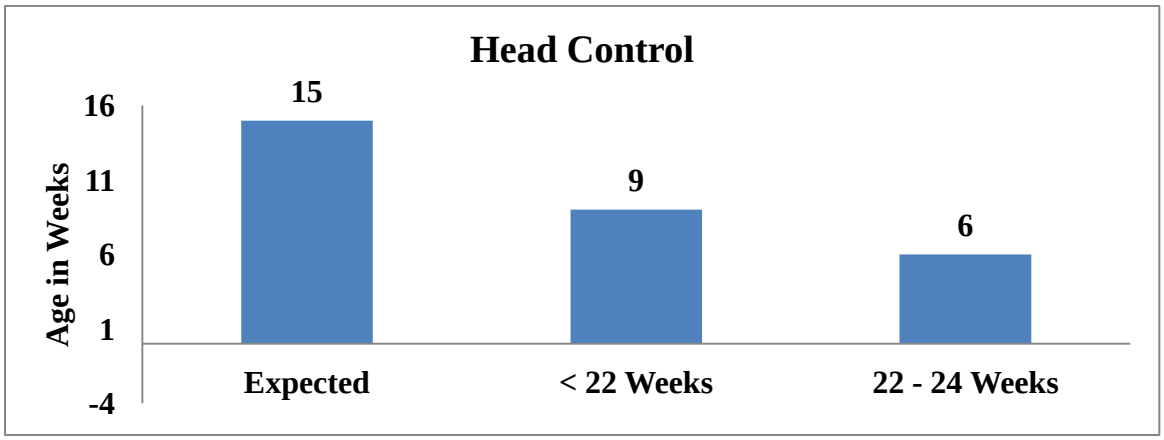


Head Control

Age	No. of Babies
< 22 Weeks	9
22 – 24 Weeks	6



Sitting without Support

Age	No. of Babies
34 - 36 Weeks	10
< 34 Weeks	5

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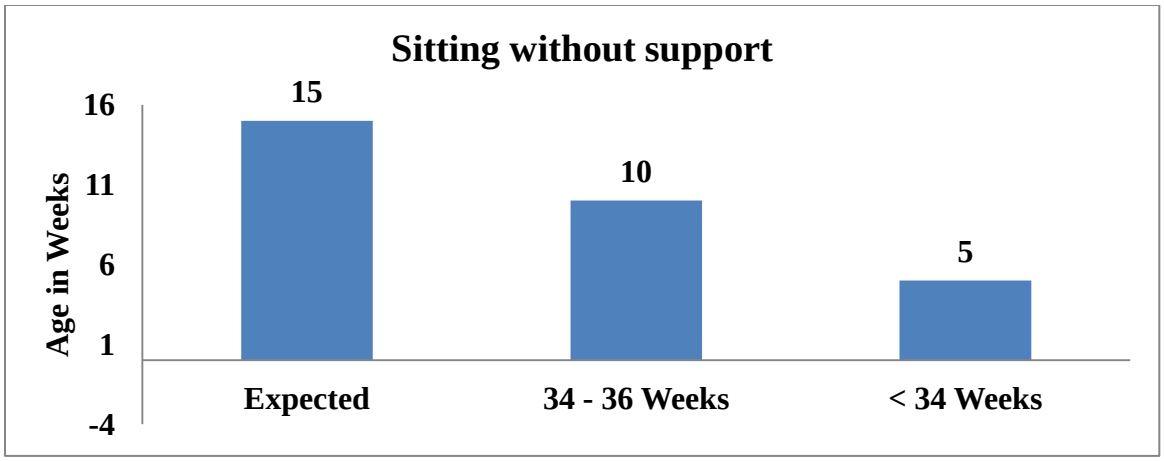
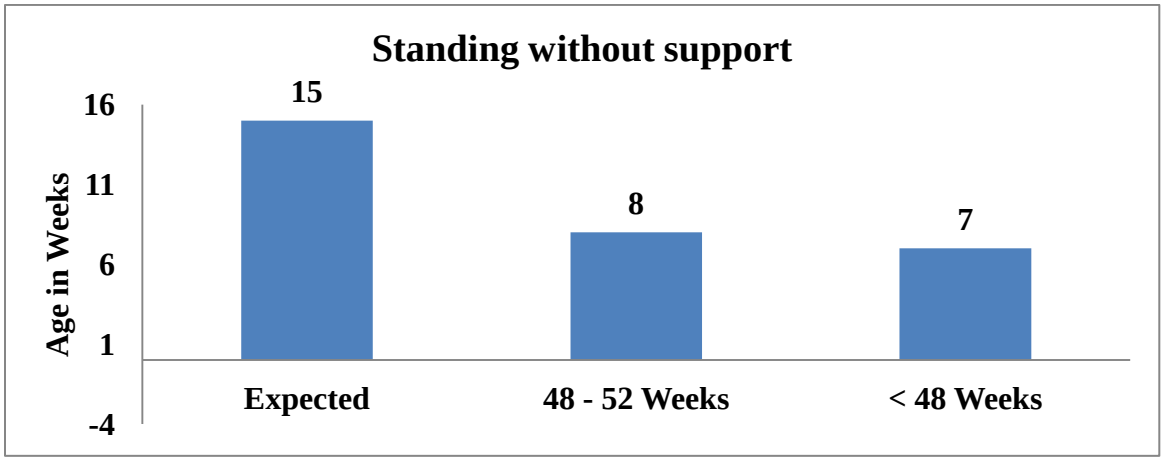


Standing without Support

Age	No. of Babies
48 – 52 Weeks	10
< 48 Weeks	5



During 1 year follow up, none of the babies showed delayed milestones.

Discussion

Our study aimed to find out neuro developmental outcome in term NB with NNH who had undergone DVET, but without any clinical evidence of Acute Bilirubin Encephalopathy. Other studies assessed neurodevelopmental outcome of acute bilirubin encephalopathy (ABE) in children who underwent DVET. Studied in 25 newborns of ≥ 35 weeks gestation with total serum bilirubin >20 mg/dl and signs of ABE and followed up at 3, 6, 9 and 12 months. The mean bilirubin at admission was 37 mg/dl. MRI and BERA were abnormal in 61% and 76%. At 1 year, DDST and neurological abnormality were seen in 60% and 27% and 80% had combined abnormal neurodevelopment. MRI had no relation (P = 0.183) but abnormal BERA had a significant association (P = 0.004) with abnormal outcome. Concluded as intermediate and advanced stages of ABE is associated with significant adverse outcome in spite of DVET[18]. Other major risk factors identified in literatures are prematurity, Sepsis and CNS infections, HIE [3,5,67,8,] . More than one risk factor results in poor neurodevlopmental outcome

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comparing to single risk factor[11]. Hyperbilirubinemia in the neonatal period is a condition which may be overlooked or delay in recognition. This ends in serious complications which are preventable by close monitoring and appropriate intervention at appropriate time. Rational management of hyperbilirubinemia is dependent on reliable laboratory facilities for serum bilirubin estimation following the recommended guidelines for imitating treatment for appropriate age and weight and exchange transfusion for appropriate age and weight. NNH is one of risk factors for Auditory Neuropathy Spectrum Disorder. NNH neonates have a lower incidence of ANSD in the exchange transfusion group than in the phototherapy group. Neonates who meet the standards of exchange transfusion adopt this therapy in early stage, which can quickly decrease bilirubin level and ultimately reduce incidence of ANSD. DVET done for sepsis alone the improvement in outcome is not convincing.

Conclusion

On conclusion, the importance of DVET in severe NNH is still promising and though some studies are there favouring IPT instead of DVET[21], many articles support the use of timely and appropriate DVET for severe NNH to get good neurological outcome and to get rid of other hearing related sequele. When the recommended guidelines are followed in evaluating and treating the neonates with neonatal hyperbilirubinemia in selected neonates with the minimal resources available even in a secondary level care centre, it is possible to prevent complications related to neonatal hyperbilirubinemia.

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