

Original Research Article

Neurological outcome of high-risk neonates at 40 weeks of gestational age and at three months of corrected gestational age

Ameer Khan^{1*}, Anil Galwa²

¹Department of Pediatrics, GMC Banda, Uttar Pradesh, India

²Department of Pediatrics, JMU Medical College, Jaipur, Rajasthan, India

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*Correspondence:

Dr. Ameer Khan,

E-mail: drameerkhangmc@gmail.com

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ABSTRACT

Background: Infants born <30 weeks' gestation is at increased risk of long-term neurodevelopmental problems compared with term born peers. The predictive value of neuro behavioral examinations at term equivalent age in very preterm infants has been reported for subsequent impairment. Therefore, this study aims to attempt to study incidence of neurological abnormality in high risk neonates in our neonatal intensive care unit.

Methods: A prospective cohort observational study was conducted at centre for comprehensive child health, division of neonatology, Pushpanjali Crosslay hospital (Max super speciality hospital, Vaishali), Vaishali, Ghaziabad, Uttar Pradesh, India. Duration of study was October 2014 to September 2015. Seventy-five high risk neonates fulfilling the inclusion criteria admitted at NICU were recruited after taking informed consent from mothers /fathers.

Results: Total 75 high risk newborns were studied. Their clinical data was noted, neurodevelopmental, neurosensory examination done at 40 weeks of completed gestational age and also at 3 months on follow up. The data was collected according to pre-decided proforma. Neuro developmental assessment was done by updated Amiel-Tison manual of neurological examination. On follow up at 3 months all the newborns who were normal (54) at 40 weeks were found to be normal (100%) and also all those who were definite abnormal (4) at 40 weeks were found to be definite abnormal (100%). But out of the 17 who were moderately abnormal at 40 weeks, 13 (76.5%) have become normal and 4 (23.5%) remained moderately abnormal and none progressed to definite abnormality.

Conclusions: There is lack of awareness regarding dog bite and its management among the rural population.

Keywords: Delivery, Follow-up, Gestational, Neurological

INTRODUCTION

A gradual improvement in neonatal survival of sick and low birth weight babies has been noted in India during last two decades, a trend similar to that seen in developed countries. This is attributed to advances in antenatal and neonatal intensive care, development of several levels II and III care nurseries both in private and government sector for improved care during delivery and basic neonatal care at all levels. Evidence from developed

countries has shown that improved survival is not associated with decrease in disabilities, rather more infants have increased risk of disabilities that need special follow up.¹ For neonates with complicated pregnancy, birth or neonatal course, parental concern whether their child will be normal later is intense. Anticipation of future neurodevelopmental problems during neonatal period and infancy can help to predict neurological abnormality early for appropriate early intervention. Due to limited resources in our country, the high birth rate,

high incidence of low birth rate and birth asphyxia etc., the problem is how to select which babies will need early intervention and follow up for early detection of neurodevelopmental abnormalities.² Ultrasound US detects only structural damage but damage due to moderate hypoxic ischemia often may not be detected. Neurological evaluation of new born is an obvious parameter for reviewing obstetric and neonatal strategies, and an association of perinatal events has been noted to be associated with neonatal morbidity.³ Follow-up studies with a careful study design can give valuable information on the proportion of children who will develop impairments, the timings when particular impairments can be most accurately and reliably observed, on possible causal relationship between perinatal factors and outcome.^{4,5} These data are important to physicians taking care of families with high risk infants, in order to decrease the, wait and see attitude and to know the diagnosis and prognosis of their child.⁶ Neonatal neurological examination appears to be a valuable, cost effective tool for selecting infant for follow up. Although majority of neurologically abnormal infants recover later, but problems persist in some infants and they are at risk for handicaps later. Neonatal neurological examination is one of the available tools in predicting the future development of an infant. An abnormal result of the examination has been shown to associate with an abnormal development outcome in full-term infants with or without asphyxia, and in preterm infants.^{7,8} Normal neonatal neurological examination even in the presence of clearly defined risk factors assures normality and these neonates do not need follow up if cranial US is also normal.

Most signs of neurological dysfunction except seizures and coma are not specially recorded in medical charts, but it has been shown that abnormal neonatal neurological signs may be associated with later mental handicaps.⁹ The present study is an attempt to study incidence of neurological abnormality in high risk neonates in our neonatal intensive care unit and to find out association with antenatal, perinatal and neonatal factors for predicting risk for deviant development.

METHODS

A prospective cohort observational study was conducted at center for comprehensive child health, division of neonatology, Pushpanjali Crosslay Hospital (Max super speciality hospital, Vaishali), Vaishali, Ghaziabad, Uttar Pradesh, India.

Duration of study was October 2014 to September 2015. Seventy-five high risk neonates fulfilling the inclusion criteria admitted at NICU were recruited after taking informed consent from mothers/fathers. Details of all high-risk neonates admitting in NICU were recorded in predesigned proforma. Antenatal and natal history were

elicited with special reference to high risk maternal and obstetric factor.

Inclusion criteria

- All preterm and term high risk neonates admitted to pushpanjali Crosslay hospital (Max Super Specialty Hospital, Vaishali) NICU during study period
- All high-risk neonates described as per NNF 2010.

Exclusion criteria

- Presence of congenital anomalies
- Newborns whose mothers were on antiepileptic or anti-psychotic drugs.

Neurological assessment was done at 40 week and 3 months±7 days. Amiel-Tison neurological assessment at 2002 (ATNAT) was used.¹⁰ The complete procedure takes approximately 5 minutes. A simple 0, 1 and 2 scoring system is proposed. Because this coding system is not quantitative, any computation of quotient or total score is inappropriate. The central nervous system function may be judged optimal when every individual item is coded 0 when a score of 1 is assigned on some or most of the items, an impairment of minor to moderate degree is considered. When some or most of the items are coded with 2, severe impairment should be considered. All the morbidities and maternal risk factors were recorded in a predesigned study Performa.

RESULTS

Over period of 12 months from October 2014 to September 2015, 75 high risk newborns were included. Neurological assessment was done at 40 weeks of gestational age and repeated at 3 months±7 days on follow up. Antenatal, perinatal and neonatal factors were recorded.

Table 1: Gestation age wise distribution.

Gestational age	Frequency	%
Below 30 weeks	11	14.7
30 to 31 + 6 weeks	10	13.3
32 to 34 + 6 weeks	24	32.0
35 to 36 + 6 weeks	19	25.3
>37weeks	11	14.7
Total	75	100

The study population included 64(85.3%) preterm and 11(14.7%) term neonates. Majority of preterm neonates had a gestational age of 32 to 34+6 weeks (32%) followed by 35 to 36+6 weeks (25.3%) (Table 1).

The mean duration of NICU stay was 24.31±13.20 days, with shortest stay of 5 days and longest stay of 63 days.

Table 2: Gestational age wise outcome at 40 weeks.

Gestational age	Normal	Moderate abnormal	Definite abnormal	P -value
	Frequency (%)	Frequency (%)	Frequency (%)	
Below 30 weeks	10 (90.9)	1 (9.1)	0 (0.0)	0.001
30 to 31+6 weeks	10 (100)	0 (0.0)	0 (0.0)	
32 to 34+6 weeks	18 (75.0)	6 (25.0)	0 (0.0)	
35 to 36+6 weeks	6 (31.6)	10 (52.6)	3 (15.8)	
>37 weeks	10 (90.9)	0 (0.0)	1 (9.1)	
Total	54 (72.0)	17 (22.7)	4 (5.3)	

Table 3: Gestational age wise outcome at 3 months.

Gestational age	Normal	Moderate abnormal	Definite abnormal	P -value
	Frequency (%)	Frequency (%)	Frequency (%)	
Below 30 weeks	10 (90.9)	1 (9.1)	0 (0.0)	0.361
30 to 31+6 weeks	10 (100)	0 (0.0)	0 (0.0)	
32 to 34+6 weeks	22 (91.7)	2 (8.3)	0 (0.0)	
35 to 36+6 weeks	15 (78.9)	1 (5.3)	3 (15.8)	
>37weeks	10 (90.9)	0 (0.0)	1 (9.1)	
Total	67 (89.3)	4(5.3)	4 (5.3)	

Table 4: Comparison of neurological outcome at 40 weeks GA and at 3 months of age.

Outcome at 40 weeks	Outcome at 3 months			P value
	Normal Frequency (%)	Moderate abnormal Frequency (%)	Definite abnormal Frequency (%)	
Normal (n=54)	54 (100)	0 (0.0)	0 (0.0)	<0.001
Moderate abnormal (n=17)	13 (76.5)	4 (23.5)	0 (0.0)	
Definite abnormal (n=4)	0 (0.0)	0 (0.0)	4(100)	
Total (n=75)	67 (89.3)	4 (5.3)	4 (5.3)	

At 40 weeks the moderately abnormal and definite abnormal neurological assessment were highest in 35-36+6weeks gestation age group i.e.10 (52.6%) and 3(15.8%) respectively. It was also noticed that neurological abnormality was minimum in preterm group that is below 30-31+6 week’s age group. Its appeal’s that prematurity in itself is not the risk factor for neurological abnormality (Table 2).

At 3 months the moderately abnormal and definite abnormal neurological assessment were highest in 35-36+6 weeks gestation age group i.e. 1 (5.3%) and 3 (15.8%) respectively. 10 newborns who are moderately abnormal in 35-36+6 weeks age group at 40 weeks when followed at 3 months of age only 1 found to be moderately abnormal rest 9 have normal neurological assessment while 3 newborns who are definitely abnormal at 40 weeks of gestation in same group are found to be definitely abnormal when followed at 3 months of age. In newborns who were born at 32-34+6 of gestation when assessed at 40 weeks of gestation only 6 were moderately abnormal while none were definite abnormal. Among 6 newborn who were moderately abnormal when followed up at 3 months of age only 2 were moderately abnormal rest 4 were normal (Table 3).

All the newborns who were normal (54) at 40 weeks, when followed at 3 months were found to be normal. Those who were moderately abnormal (17) at 40 weeks, on follow up at 3 months, 13 have become normal and 4 remained moderately abnormal and none progressed to definite abnormality. Those newborns who were definite abnormal (4) at 40 weeks were found to be definite abnormal at 3 months of age also (Table 4).

DISCUSSION

Advance in medical management have greatly improved the survival of newborns but mere survival doesn’t completely satisfy holistic approach of health. If the child remains dependent for life on the family, it will be huge burden not only on family but also on the society as well. So, there is need to understand the incidence and severity of these neurological problems and their risk factor for their causation. Neurological assessment of neonate may provide objective assessment of nervous system function. So that we can intervene early and help the child achieve his/her maximum neurological development. The neurological assessment in clinical practice is based on methods of Prechtl at term age, Dubowitz and Dubowitz at preterm and term age, Saint-Anne Dargassies and

Amiel-Tison at both ages. All these methods have been shown to be of value in predicting neurodevelopment outcome of an infant.¹¹

A sensitive and specific clinical neurological examination for high risk neonate should allow actual assessment of brain status and predict future major and minor neurodevelopment problems. The method also should be easy to perform well tolerated by infants, sensitive to identify neurological deviations and have good inter observer reliability and should have continuity from birth to early school years. Amiel-Tison neurological assessment full fills all these criteria.¹² In present study 75 high risk newborns 64(85.3%) preterm and 11(14.7%) term neonates) followed at 40 weeks of completed gestational age, 54(72%) were neurologically normal, 17 (22.7%) were moderately abnormal, 4 (5.3%) were definitive abnormal. On follow up at 3 months the normal and definitive abnormal infants remained neurologically same. Among the 17 moderate abnormal infants 13 (76.5%) have become normal and only 4(23.5%) remained moderately abnormal on neurological examination at 3 months on follow up. The incidence of severe neurological disabilities like cerebral palsy has remained at 4.5-10% over many years, this is in overall infant population.¹³ Observing many of the studies world over, in present study.¹⁴⁻¹⁹ At 3 months on repeat neurological examination 4 (5,3%) had moderate abnormality and 4 (5.3%) others had definitive neurological abnormality. So, totally 8 (10.6%) high risk newborns had persisting neurological abnormality.

On follow up at 3 months all the newborns who were normal at 40 weeks were found to be normal and also all those who were definite abnormal at 40 weeks were found to be definite abnormal. But some of the subjects, who were moderately abnormal at 40 weeks, have become normal and none progressed to definite abnormality. Incidence of neuro abnormality is not less than 25-30% in the high-risk newborns even with best of the medical facilities. Beside the motor abnormalities, the high-risk newborns are also associated with high incidence of neuro-sensory impairment, cognitive, learning disabilities, and behavioral problems like ADHD and depression, subtle problems like clumsiness. It undermines the need for follow up of all the high-risk newborns with periodic neurological examination at least till 1 year of age even if normal and even further for those who were abnormal.

CONCLUSION

This periodic neurological examination enables possible early intervention, parent counselling, prevention of further deterioration and also help in early rehabilitation.

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