

ORIGINAL ARTICLE

CORRELATES OF NERO-DEVELOPMENTAL OUTCOME IN HIGH RISK INFANT IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Neurodevelopmental delay (NDD) accounts for higher morbidity in high risk infants treated at Neonatal ICU. Structured follow up and timely intervention can prevent or modify disability caused by NDD. Present study was conducted with purpose of identifying factors associated with NDD to use them as early warning signs of NDD.

Methods: Longitudinal prospective observational study was done at tertiary care hospital at Surat. Total 52 high risk neonates admitted in NICU of the hospital during 11 months study period were included in the study. Each neonates were followed up for another 9 months for the development of NDD using neurological Amiel-Tisons angle measurement method.

Results: Association was found between various perinatal factors like maternal age, sex of infant, presentation of fetus at the time of delivery, presence of meconium stained liquor with presence of NDD in infants but none of these factors found significantly associated with NDD. APGAR score less than 5 at 1 minute and 5 minute were found 2.2 times and 5 times more associated with NDD respectively but association was not found statistically significant.

Conclusion: Perinatal factors like high maternal age, breech presentation, Meconium stained liquor and lower APGAR score at birth were found to be associated with NDD in infants. These factors can be followed from birth of the baby so that early intervention to prevent and treat NDD can be implemented early and permanent neural damage can be prevented.

Keywords: Neuro-development, High risk infant, perinatal, Amiel-Tisons

INTRODUCTION

Fetal and extra-uterine life forms a continuum during which human growth and development are influenced by genetic, environmental, and social factors.¹ The neonatal period is a highly vulnerable time for an infant, who is completing many of the physiological and biological adjustments required for extra-uterine existence.² The high neonatal morbidity and mortality rates demonstrate the fragility and instability of life during this period.³ In India, the Infant Mortality Rate is approximately 40 per 1000 live births in which two-thirds part is contributed by neonatal deaths.⁴ Last two decades have witnessed a steady improvement in the quality of perinatal care in India. Even though there has been a substantial improvement in neonatal survival, the incidence of chronic morbidities and

adverse outcome in survivors continues to be high.^{5,6}

The incidence of severe disabilities like Cerebral palsy has remained quite unrelenting at 4.5-10% over the past two decades. This is also associated with reports of increasingly high incidence of neuro-sensory impairment (blindness and deafness), cognitive, learning disabilities and behavioral problems like ADHD and depression.^{7,8} Perinatal risk factors and course of neonatal illness define a group of neonates at increased risk of neurodevelopmental disability. Timely and appropriate intervention can prevent or modify many of these disabilities (example – laser photocoagulation for ROP, timely hearing aid for hearing impaired).⁹⁻¹¹

There is a lack of knowledge among neonatal specialists, primary health care providers, lack of

coordination among health care providers and lack of parent understanding of need for follow up. Structured follow up programme can result in improvement of implementation and compliance of the multidisciplinary follow up. With above background, the present study was conducted to find out various perinatal factors associated with neurodevelopmental delay (NDD) in high risk infants admitted in NICU of a tertiary care hospital.

METHODS

This was a longitudinal prospective observation study. Initial cross section study was done to collect certain data at the time of recruitment of patients which was followed by multiple cross sectional observations at specific time interval to collect follow up information. The present study was done in Surat Municipal Institute of Medical Education & Research (SMIMER) which is a tertiary care multi-specialty hospital in Surat. This study was conducted in the Neonatal Intensive Care Unit (NICU) of the hospital where critically ill neonates and infants are admitted to provide intensive treatment. All the high risk neonates admitted in to the NICU (extramural or intramural) were included in the study. Patient's recruitment was started in February 2010 and continued till December 2010 i.e. 11 months. Total 52 infants were included in the study. Out of them 2 infants were loss to follow up. Informed verbal consent was sought from at least one parent or guardian before including the patient in to the study. All recruited neonates were followed up for 9 months and so the data collection was continued till September 2011. A pretested performa was used to record various information collected from the pa-

tient. This information was collected at various point of time after recruitment of the patients. Certain information like date of birth, time of birth, presentation at the time of delivery, mode of delivery, complications if any, indications in case of operative delivery and date of admission were collected from the parents. These data were analyzed using SPSS software version 14. The patients classified according to the risk stratification charts and follow up at corrected 3, 6, and 9 months of age and neurological Amiel-Tisons angle measurement method was done to ascertain presence of neurodevelopmental delay.¹² The assessment is done under the following headings:

Neuromotor:- Tone in upper limb , lower limb and axial

Neurosensory:- Hearing and vision

Neurobehavioural:- Arousal pattern, quality of cry, suckling , swallowing

Head growth:- Head circumference and also skull for sutures, size of anterior fontanel

RESULT

Table no 1 shows association between various perinatal factors like maternal age, sex of infant, presentation of fetus at the time of delivery, presence of meconium stained liquor with presence of NDD in infants. Infant born to mother aged less than 20 years and more than 30 years are approximately 2 times more likely to develop NDD compared to maternal age range of 20-30 years. Infant born with meconium stained liquor has 4.75 times more chances of developing NDD than the infants without meconium stained liquor. None of the factors is having significant association with NDD in infants during follow up period.

Table 1: Perinatal Factors associated with Neurodevelopmental delay (NDD)

Variable	Infants with Neurodevelopmental delay (n=10) (%)	Infants without Neurodevelopmental delay (n=40) (%)	Total	Odds Ratio (95% CI)	P value
Maternal age in years					
17-20	5 (50)	14 (35)	19	2.054 (0.47-8.96)	0.3653
21-30	4 (40)	23 (57.5)	27	1	-
30-40	1 (10)	3 (7.5)	4	1.917 (0.16-23.34)	0.6366
Sex					
Male	6 (60)	25 (62.5)	31	0.9 (0.22-3.72)	0.8802
Female	4 (40)	15 (37.5)	19		
Presentation					
Vertex	8 (80)	34 (85)	42	0.7059 (0.12-4.17)	0.6973
Breech	2 (20)	6 (15)	8		
Meconium stained liquor					
Present	2 (20)	2 (5)	4	4.75 (0.58-38.9)	0.19
Absent	8 (80)	38 (95)	46		

Table 2: Association between APGAR score¹³ and Neurodevelopmental delay (NDD)

APGAR Score	Infants with Neurodevelopmental delay (n=10) (%)	Infants without Neurodevelopmental delay (n=40) (%)	Total	OR (95% CI)	P value
At 1 min					
≤5	3 (30)	7 (17.5)	10	2.286 (0.46-11.42)	0.34
06-07	1 (10)	0	1	-	-
≥8	6 (60)	32 (80)	38		-
At 5 min					
≤5	3 (30)	3 (7.5)	6	5 (0.83-30.07)	0.1081
06-07	0 (0)	2 (5)	2	-	-
≥8	7 (0.7)	35 (87.5)	42		-

Table 2 shows association between APGAR score at 1 minute and 2 minute with NDD in infants. Infants with APGAR score less than 5 at 1 minute are 2.2 times more likely to have NDD than infants having score 8 or more, but the association is not statistically significant. Likewise, Infants with APGAR score less than 5 at 5 minute are 5 times more likely to have NDD compared to infants having score 8 or more, but the association is not statistically significant.

DISCUSSION

In the present study, maximum no. of high risk infants belong to 21-30 years of maternal age. In this study we found that the proportion of developmental delay was seen maximum in infants born where maternal age was less than 20 or more than 30 between 30-40 years. Minimum infants developed neurological delay where maternal age was between 30-40 years. These findings are in accordance with the study of Amrajyoti et al¹⁴ which showed incidence of NDD increase with increasing maternal age.

In the present study, 62% of patients were males and 38% were females. Out of 31 male infants, 6 (19.4%) infants developed developmental abnormality. Whereas out of 19 female infants, 4 (21.2%) developed developmental abnormality. According to the study done by Amarjyoti et al¹⁴, 64.1 of high risk infants were males. The further study was not done in the above mentioned study. We concluded that there was no difference in the incidence of developmental delay in male and female high risk infants.

In the present study, infants with breech presentation had higher incidence (25%) of developmental delay as per Amiel-Tisons method than infants with vertex presentation (19%). The study of Amarjyoti et al¹⁴ suggests better neurodevelopmental outcome in newborns delivered with vertex presentation. This finding is in accordance with the present study. In the present study 50% of

infants with meconium stained liquor have developmental abnormality. The study done by Beligere et al¹⁵ showed higher percentage (62%) of NDD in infants having meconium stained liquor.

In the present study, 3 (30%) out of 10 infants with very low APGAR score (<5) at 1 minute had NDD as per Amiel-Tisons method. Present study also suggests that infants with very low APGAR score (<5) at 5 minutes were 6, out of which 3 (50%) had NDD. According to Wolf et al¹⁶, 22% infants with low APGAR score at birth, found to have NDD which lower than results found in the present study. This difference may be due to difference in scores used for ascertaining NDD in infants. The association between low APGAR score and NDD was not found statistically significant which was also concluded by Behnke et al.¹⁷

CONCLUSION

Maternal ages less than 20 years and more than 30 years are associated with more prevalence of neurodevelopmental delay compared to maternal age 21-30 years. Our study concluded that there was no difference in the prevalence of developmental delay in male and female infants and type of presentation the infants delivered. Meconium stained liquor has very low APGAR score at 5 min. have better association neurodevelopment outcome than with 1 min APGAR score. These perinatal factors can be followed from birth of the baby so that early intervention to prevent and treat neurodevelopmental delay can be implemented early and permanent neural damage can be prevented.

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