

ORIGINAL ARTICLE

## NEURODEVELOPMENTAL OUTCOMES OF PREMATURE BABIES BORN AT LESS THAN 29 WEEKS: A DESCRIPTIVE STUDY AT A TERTIARY CARE REFERRAL NICU IN SOUTH INDIA

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### ABSTRACT

**Aim:** To study the neurodevelopment outcomes of survivors at follow-up among babies born at less than 29 weeks of gestation.

**Methods:** This descriptive study was carried out in preterm babies born at less than 29 weeks of gestational age in a tertiary care referral neonatal unit in south India. These babies were followed up for corrected age of 6 months and assessed for developmental by DASII (Developmental Assessment Scales for Indian Infants) scales. Motor and mental development quotient less than 85% was considered abnormal.

**Results:** Of the 117 admissions, 74 (63%) survivors were discharged from NICU. Five babies died after discharge from hospital and 5 babies had not reached corrected age of 6 months. Of the remaining 64 babies, 48 babies attended developmental clinic. Motor DQ was less than 85% in 14 (29%) babies. Mental DQ was less than 85% in 16 (33%) babies. Visual and auditory cognizance clusters were <10th percentile in 14 (29%) and 8 (17%) babies respectively. Refractive errors were diagnosed in 12 (25%) babies. Twenty-two (46%) babies had neurological impairment in either motor or mental domain. Intraventricular hemorrhage/periventricular hemorrhage ( $p < 0.001$ ), culture positive sepsis ( $p = 0.004$ ) and chronic lung disease at 36 weeks of postmenstrual age ( $p = 0.019$ ) were significantly higher in babies who had neuroimpairment when compared to babies that were normal (DQ >85%) at follow-up.

**Conclusion:** About half of survivors of extremely low gestational age were developing normally for age.

### Introduction

The survival of premature babies has increased with improved perinatal care. However, survival without neuromorbidity remains a challenge. Accordingly, counseling of a parent whose babies are born at extreme prematurity depends not only upon the willingness of parents, but also upon availability of resources, expertise of care for extreme prematurity and financial security. The level of care available at the location of delivery is extremely important consideration while caring for babies born at <25 weeks.<sup>1</sup> The Indian data, though scarce has shown an average survival rate of 29% for babies born less than 28 weeks of gestation.<sup>2,3</sup> This study was taken up to assess neurodevelopment outcomes among babies born at less than 29 weeks of gestation.

### Methods & Materials

This was a descriptive study conducted at tertiary care referral unit in Chennai. All the babies born at <29 weeks of gestation and admitted to neonatal intensive care unit (NICU) of Mehta Multispecialty Hospitals India Pvt. Ltd. from January 2012 to December 2017 were

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### ARTICLE HISTORY

Received 27 February 2019

Accepted 21 March 2019

### KEYWORDS

preterm, neurodevelopment

included for analysis. The primary objective of the study was to assess the neurodevelopmental outcomes of the survivors at follow-up among babies born at <29 weeks of gestation. Gestational age was assigned based on the best estimate from a combination of last menstrual period and dating from first trimester scan. Survival rates for each gestational age were estimated. The short term outcomes which were studied were the following: chronic lung disease (CLD) at 36 weeks of post-menstrual age (PMA), retinopathy of prematurity (ROP) needing treatment, abnormal cranial ultrasonogram (intraventricular hemorrhage – IVH grade 3-4 or periventricular leukomalacia -PVL), necrotizing enterocolitis (NEC) beyond grade I and surgical ligation of patent ductus arteriosus (PDA). The survivors were called for follow-up every 2 monthly in the first 6 months of life. Neurodevelopmental outcomes were studied from 6 months of corrected age in developmental clinic. Those babies who did not complete 6 months of corrected age were excluded for neurodevelopment assessment. There was no screening test used as all members of this cohort were considered as high risk neonates and were directly assessed by formal developmental test. DASII (Developmental Assessment Scales for Indian Infants) was used for assessment of long term neurodevelopment outcomes.<sup>4</sup> Assessment was done by personnel trained in DASII. Developmental Quotient (DQ) >85% was considered as normal. Some babies had neurodevelopment assessment done more than once, as they were followed up every 6 months in the development clinic. In such

**Table 1.** Comparison of survivors with developmental quotient (DQ) above and below 85% at follow up.

MORBIDITY	DQ <85% (N=22) N (%)	DQ >85% (N=26) n(Percentage)	p value
SGA	7 (32%)	6 (23%)	0.489
IVH/PVL	8 (36%)	0	<0.001
cSEPSIS	12 (55%)	4 (15%)	0.004
tROP	6 (27%)	5 (19%)	0.514
tPDA	2 (9%)	1 (4%)	0.482
CLD	8 (36%)	2 (8%)	0.019

**Note.** DQ: Developmental quotient, SGA: small for gestational age, IVH: intraventricular hemorrhage grade 3-4, PVL: periventricular leukomalacia, cSEPSIS: culture positive sepsis, tROP: treated retinopathy of prematurity, tPDA: treated patent ductus arterioles, CLD: chronic lung disease.

cases, the last assessment done was considered for final analysis. At the same time, due to small sample size and difficulty in achieving good follow-up rates, immunization visits and other outpatient visits were also utilized for assessment of neurodevelopment.

### Results

Of the 117 admissions, 74 (63%) survivors were discharged from NICU of which culture positive sepsis was present in 19 (26%) babies. Survival rates were 30% (7/23), 61% (14/23), 72% (18/25) and 76% (35/46) for babies with gestational age of 25, 26, 27 and 28 weeks respectively. At least 1 dose of antenatal steroid was received by 58% of mothers. Abnormal cranial USG was seen in 8 (11%), ROP that required in treatment was present in 12 (16%), surgical ligation of PDA was needed in 4 (5%) and CLD in was seen in 11 (15%) babies. At least one of these major morbidities was seen in 18 (24%) of survivors. Five babies died after discharge from hospital and 5 babies had not reached corrected age of 6 months. Of the remaining 64 babies, 48 babies attended developmental clinic. Thus, the follow-up rate was 75%. The mean age at follow-up was 12 months (range 6-30 months). Motor DQ was less than 85% in 14 (29%) babies. Mental DQ was less than 85% in 16 (33%) babies. Visual and auditory cognizance clusters were <10th percentile in 14 (29%) and 8 (17%) of babies respectively. Refractive errors were diagnosed in 12 (25%) babies. Thus, a total of 22 (46%) babies had neurological impairment in either motor or mental domain. Cerebral palsy was diagnosed in 4 (8.3%). Intraventricular hemorrhage/periventricular hemorrhage, culture positive sepsis and CLD at 36 weeks of PMA were significantly higher in babies who had neuroimpairment when compared to babies that were normal (DQ >85%) at follow-up. (Table 1).

### Discussion

As expected, this study showed increasing survival rates with increasing gestational age. One important observation was that the survival rates among babies born at 27 and 28 weeks were comparable (72% and 76% respectively). The studies from India have shown survival rates of 21% and 37% for babies born at <28 weeks of gestation, while the present study shows survival rates of 43%.<sup>2,3</sup> These differences are attributable to the year of conducting the study and the referral population that is served by the institute. There were no babies born at less than 25 weeks who were available for assessing the neurodevelopment. The emphasis was given to gestational age rather than birth weight because every 3 days of life contributes to 0.1 point of age for assessment by DASII.<sup>4</sup>

An Indian study has addressed long term neurodevelopment outcomes in extreme premature babies at 2 years of corrected age.<sup>5</sup> The study showed that motor

and mental DQ of <85% was seen in 46% and 83% respectively. In the present study motor and mental DQ <85% was seen in 29% and 33% respectively. The probable reasons for this difference could be that the babies with SGA (24% vs 41%), culture positive sepsis (26% vs 41%) and abnormal cranial USG (29% vs 43%) were almost half in the present study compared to that seen by Mukhopadhyay et al.<sup>5</sup>

EPIPAGE 2 study<sup>6</sup> dealt with babies born at 25-26 weeks. Survival without moderate or severe neuromotor or sensory morbidity was seen in 62.3% of the cohort. The present study dealt with gestational ages ranging from 23 to 29 weeks. Survival without moderate to severe neuroimpairment was seen in 54% of babies. However, the drastic differences in size of cohort, gestational age, population base, type of tests used for neuroassessment need to be respected.

The strength of the present study is that a formal development test is administered to all the infants enrolled and the rates of increasing survival over the years is encouraging for the unit. There are many limitations in the present study like small sample size, high rates of loss to follow-up. The small sample size further limits the ability to adjust the outcomes based on birth weight and need for ventilation.

### Compliance with Ethical Standards

**Funding:** None

**Conflict of Interest:** None

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