Developmental outcome of the preterm babies born in a tertiary care unit, Jaffna, Sri Lanka, during first year of life by using Bayley scales of infant and toddler development

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Abstract - Developmental functioning of infants and young children who are between 1 month and 42 months of old age is being assessed by Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) tool. The aim of this study was to assess developmental outcome of the preterm babies during their one year of life. A longitudinal study was conducted among 173 preterm babies who were born between 28+1- 36 +6 weeks of gestation during the period of October 2015 to February 2017 in Teaching Hospital, Jaffna, Sri Lanka. The mean gestational age was 35(±1.96) weeks. Among the preterm babies, 52.6% (91 babies) were males. The mean birth weight of the preterm babies was 2.23 (±0.58) kg. The mean cognitive score at their 3, 6 and 12 months were 87.6 (±9.9), 98.4 (±9.9), 95.1 (±6.8) respectively. The mean language score at their 3, 6 and 12 months were 96.8 (±10.6), 97.7 (±11.8), 101.2 (±89.1) respectively. The mean motor score at their 3, 6 and 12 months were 86.9 (±9.1), 97.7 (±11.8), 92.9 (±8.5) respectively. In paired t- test, cognitive scores increased significantly between 3 and 6 months of age (p= 0.000) and between 3 and 12 months of age (p=0.000), while decreased between 6 and 12 months of age (p=0.013). Language scores increased significantly between 3 and 6months (p=0.009). Motor scores increased significantly between 3 and 6 months (p=0.000) and between 3 and 12 months (p=0.000). In this present study it was found that cut-off of composite score of 70 was appropriate to define developmental delay.
Key words: Preterm babies, Cognitive development, Language development, Motor development, Bayley Scales of Infant and Toddler Development

I. INTRODUCTION

The most widely and commonly used measures for early cognitive function in high-risk and preterm infants are the Bayley Scales of Infant Development (BSID) and its revisions. Among them, Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) is internationally recognized as most comprehensive tools to assess children from as young as one month old to 42 months. The primary purpose of this scale is to identify children with developmental delay and to provide information for intervention planning. It includes 5 distinct scales such as cognition, language, social- emotional, motor and adaptive behavior. Professionals (early interventionists, Pediatric Nurse Practitioners, Psychologists) with different areas of specialization who are familiar with assessment procedures for young children can use the Bayley scale.

No studies were carried out done in Jaffna district on this subject. This study was carried out by using Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) to measure the development of such infants can help to identify the problem early and start interventions early. This will help to educate the parents, care givers on expected common problems of their babies during infant life and early childhood.

II. METHODOLOGY

A longitudinal study was conducted among 173 preterm babies who were born between 28+1- 36 +6 weeks of gestation during the period of October 2015 to February 2017 in Teaching Hospital, Jaffna, Sri Lanka. Four preterm babies were excluded due to death and remaining 169 preterm babies were followed up by home visit or clinic visit in Medical Officer of Health (MOHs) at 3, 6 and 12 months of age by using Bayley Scale of Infant and Toddler Development- III. Corrected age of prematurity was calculated using cut-off gestational age of 37 weeks (Fact sheet of the World Health Organization, 2017). Bayley assessments were carried out when the baby is lying on his/her back on a flat surface, holding position, floor sitting position with or without support and standing position according their age and physical ability.

The raw scores calculated for the Bayley cognitive, fine motor and gross motor scales for each participant were converted into scaled scores using the tables in the Bayley manual. The scaled scores, derived from the total raw scores on each of the subtests were transferred to composite score. Composite score less than 70 was considered as "developmental delay", while composite score of 70-79,80-119 and above 119 were considered as Borderline, Average and Superior respectively. Data were entered into Statistical Package of Social Science (SPSS), version 16.0. The Bayley-III results were reported as composite cognitive, language and motor scores of 3, 6 and 12 months of age. Paired t- test was used to compare the first, second and third assessments in different ages done in 3, 6and 12 months. p value below 0.050 was considered as statistical significant.This study was approved by Ethical Review Committee, Faculty of Medicine, University of Jaffna.

III. RESULTS

One hundred and sixty nine preterm babies had bayley assessments at 3, 6 and 12 months of age. The mean gestational age was 35(±1.96) weeks. Among the preterm babies, 52.6%

(91 babies) were males. The mean birth weight of the preterm babies was 2.23 (±0.58) kg.

The mean cognitive score at their 3, 6 and 12 months were 87.6 (±9.9), 98.4 (±9.9), 95.1 (±6.8) respectively. The mean language score at their 3, 6 and 12 months were 96.8 (±10.6), 97.7 (±11.8), 101.2 (±89.1) respectively. The mean motor score at their 3, 6 and 12 months were 86.9 (±9.1), 97.7 (±11.8), 92.9 (±8.5) respectively. The preterm babies at all three assessments were in average or above average as the mean composite scores of all three domains were above 70. However it was observed that composite score of motor domain at 3 and 12 months of age were lower than other two domains except at 6 months old in which nearly same. Developmental delay (Composite score below 70) was observed in 1 and 2 preterm babies at 6 and 12 months age respectively. Language developmental delay was identified at 3, 6 and 12 months age of 2, 2 and 1 preterm babies respectively. Developmental delay in motor domain was observed in 1, 3 and 2 preterm babies at their 3, 6 and 12 months age. Majority of preterm babies performed average range (Composite score range was 80-119) in all three domains of all assessment age. But at third month assessment, composite score of 70-79 (borderline performance) were observed in 38 (22.0%) and 45 (26.0%) babies in cognitive and motor domain respectively. Superior developmental pattern (Composite score above 119) was observed in two babies at 3rd month and another two babies at 12th month assessment in language domain.

Three Bayley- III assessments were done in 3, 6 and 12 months and results of these paired assessments are compared in Table 1. In paired t- test, cognitive scores increased significantly between 3 and 6 months of age (p= 0.000) and between 3 and 12 months of age (p=0.000), while decreased between 6 and 12 months of age (p=0.013). Language scores increased significantly between 3 and 6 months (p=0.009). Motor scores increased significantly between 3 and 6 months (p=0.000) and between 3 and 12 months (p=0.000).

IV. DISCUSSION

Developmental delay was observed in cognitive domain for 3 babies, language domain for 5 babies and motor domain for 6 babies when composite score of 70 was considered as cut off for developmental delay. One available study (Ballot, et al, 2017) reported that no child had developmental delay using a cut-off score of 70. And in our study, cognitive scores increased significantly between 3, 6 and 3, 12 months of age while their study found that above and below one year of age, the cognitive score remained unchanged.

A study (Godamunne, et al) was conducted in Gampaha district of Sri Lanka among 150 full term children aged 6, 12 and 24 months by using Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) to compare the cognitive and motor scores of Sri Lankan with that of United States children. They recommended that it is feasible to use the Bayley III to assess neurodevelopment in Sri Lankan children.

Table 1: Mean composite scores at Age 3, 6 and 12 months

Domain	No. of Pair	Age of Assess-ment (Months)	Mean Composite scores	P value
Cognitive Domain	Pair 1	3	84.4 (±9.3)	<0.001*
		6	98.4 (±9.6)	
	Pair 2	3	87.6 (±9.9)	<0.001*
		12	95.4 (±7.1)	
	Pair 3	6	98. 4 (±9.9)	0.013*
		12	96.0 (±6.9)	
Language Domain	Pair 4	3	94.3 (±7.9)	0.009*
		6	97.6 (±9.2)	
	Pair 5	3	96.7 (±10.6)	0.431
		12	103.3 (±97.1)	
	Pair 6	6	97.7 (±11.8)	0.379
		12	105.9 (±103.8)	
Motor Domain	Pair 7	3	84.9 (±9.6)	<0.001*
		6	90.9 (±8.8)	
	Pair 8	3	86.9 (±9.1)	<0.001*
		12	93.3 (±8.9)	
	Pair 9	6	91.0 (±9.3)	0.078
		12	92.7 (±9.4)	

*Statistically significant

V. CONCLUSION

This present study shows that the Bayley III can be used to assess developmental outcome of the preterm babies. Cognitive, language and motor scores were within average range that is above 70. A cut-off of 70 was appropriate for defining developmental delay in this present study.

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