



Early Physiotherapy Intervention In Low Birth Weight Infants During The First Six Months Of Life

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Abstract:

A prospective, controlled trial was conducted to assess the effect of early physical therapy intervention on low birth weight infants during the first six months of life. A cohort of 100 low birth weight(LBW) infants who got admitted in neonatal intensive care unit(NICU) and referral newborn(RNB) of Raja Muthiah Medical College and hospital(RMMC&H) were included prospectively. Infants who received regular early physiotherapy intervention were assigned as interventional group(EI) & infants who were advised but did not turn up for early intervention as comparison group(NEI).The Amiel-Tison neurologic examination and Denver developmental screening test (DDST) were used and results were compared. Results: Better performance of infants was found in EI group in neurological and developmental domains. Conclusion: The data suggest significant benefit of the use of EI program over NEI in LBW infants.

Key words: Low birth weight, Early Intervention

1.Introduction

Improving perinatal and neonatal care has led to increased survival of infants who are at-risk for long-term disabilities^{1,2}. Survivals of LBW infants have resulted in an increased incidence of physical and mental disabilities³, may impact later development such as neuromotor delays, intellectual and behavioral problems^{4,5}. Early detection of infants at high-risk is of paramount importance to assess their developmental status and for planning intervention to avoid secondary problems^{6,7}.

Early intervention (EI) consists of providing continuous multidisciplinary services to infants from birth throughout the first year of life .It means interventional therapy specified for babies at-risk for developmental delay and periodic developmental assessment of motor, cognitive function, language/adaptive functioning⁸.EI promotes child health, minimize developmental delays, cures existing disabilities, prevents functional deterioration, and promotes parent-child interaction⁸.

The goal of this study is to measure the effect of EI program in a group of high-risk LBW infants .The hypothesis is that high-risk infants under EI perform better than a group of high-risk infants without EI .DDST comprising of gross motor, fine motor, personal social and language domains were used prospectively to evaluate the effects of EI during follow-up in the first six months of life.

2. Method

2.1. Subjects

LBW newborns in NICU and RNB of our hospital over a period of two years were recruited for the study. Inclusion criteria– inadequate weight for gestational age⁹; infants with gestational age between 28-36weeks¹⁰;Singleton delivery .Exclusion criteria - Maternal history of high blood pressure; Diabetes or any chronic maternal disease during pregnancy; congenital infections; congenital malformations.

Infants who received regular early physiotherapy intervention were assigned as interventional group (EI) & infants who were advised but did not turn up for early intervention as comparison group (NEI).Sixty infants constituted the EI group(31male and 29female) and forty infants (21males and19females) comprised the NEI group.

2.2. Early Intervention

EI was initiated for High risk infants right from the neonatal period after the babies became stable. Early intervention applied remarkably to LBW infants, in order to arouse their actions and feelings, ultimately giving them a normal experience of development through interaction with the mother and environment⁸. The individually adjusted program was described to the parents (especially to the mother), who were trained and received written programs elaborated for their infants. These programs contain intensive schedules to develop elementary sensorimotor patterns^{11,12}, individualized care plans centered on the infant behavioral organization, mother-child interaction, and extending to vision, hearing, feeding, and vocalization. Stimulation was given for at least one hour a day, according to the infant feeding and sleep-time schedules. Infants were reviewed every month. It was emphasized that, aside from the training programs, the infant requires the affection and care of the family members.

2.3. Neurologic Examination.

The Amiel-Tison¹³ test was performed by a pediatric therapist, with the infant undressed and awake but quiet. Hypertonia or hypotonia were looked for by measuring the adductor angle, popliteal angle, ankle dorsiflexion, and scarf sign. Any asymmetries between the extremities were recorded.

2.4. Denver developmental screening test (DDST)

The Denver Developmental Screening Test is a simple, clinically useful tool for early detection of infants with developmental delay¹⁴. The test comprised of four domains: gross motor, fine motor/adaptive, language and personal social. The level of achievement were scored as Advanced, ok/pass, caution and fail depending on the age line¹⁵. The assessment was done according to the corrected age, often calculated prior to developmental assessment for a more accurate comparison of the developmental status⁴.

3. Data Analyses

In order to examine the effectiveness of early interventional therapy, it is proposed to apply the Chi-square test of independence to examine whether the level of achievement depends up on the early interventional therapy. Also to compare the effectiveness of the

therapy over the level of achievement in the EI group and NEI, the “Z” test for the equality of proportions is applied¹⁶.

4. Results

The last examination for the objectives of this study was performed at 6 months of age. No differences in age, socioeconomic features, and examination results were observed at the first examination. Significant differences between groups were observed with better outcome in EI than NEI group after 6 months.

4.1. Neurologic Examination

In the initial assessment, infants of 86% were suspected of neurologic abnormalities, while 14% exhibited a normal result. Six months later at the second examination, in NEI infants 12.5% present a normal result, while 87.5% had suspicion of neurologic abnormalities. In EI Group, all infants had a near normal result at sixth month. Significant differences between groups were observed with better performance in EI than NEI group.

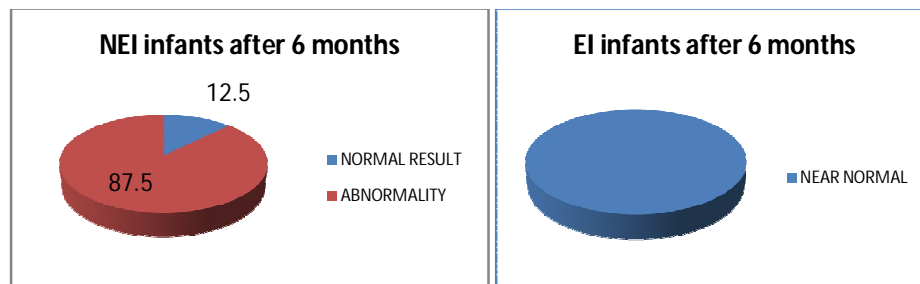


Figure 1

Figure 2

4.2. DDST

With a view to examine the impact of the EI therapy for improving the level of achievement in gross motor, fine motor/adaptive, personal social and language domains of LBW infants, the Chi-square test of independence is carried out. The results obtained are given in Table 1. The null hypothesis to be tested is H₀: The level of achievement in all domains is independent of the EI and NEI LBW infants.

Domains	Interventional (EI) / Non-Interventional (NEI)	Level of achievement (%)			
		Advanced	Ok	Caution	Fail
Gross motor	EI	33.3	35	23.3	8.4
	NEI	12.5	15	37.5	35
Fine motor	EI	25	41.7	20	13.3
	NEI	15	10	37.5	37.5
Personal social	EI	18.3	41.7	28.3	11.7
	NEI	12.5	10	25	52.5
Language	EI	16.7	45	23.3	15
	NEI	12.5	10	27.5	50

TABLE 1: Level of achievement in all domains in Early Interventional (EI) and Non-Interventional (NEI) infants

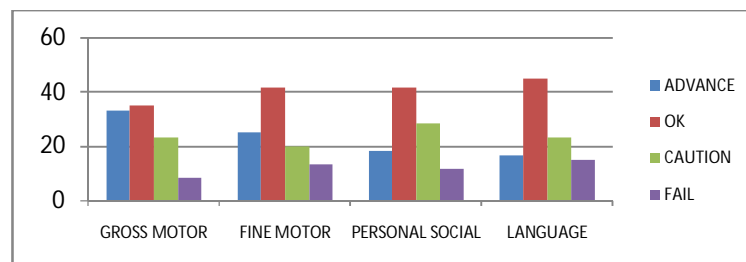


Figure 3: Level of achievement in all domains in Early Interventional (EI) infants

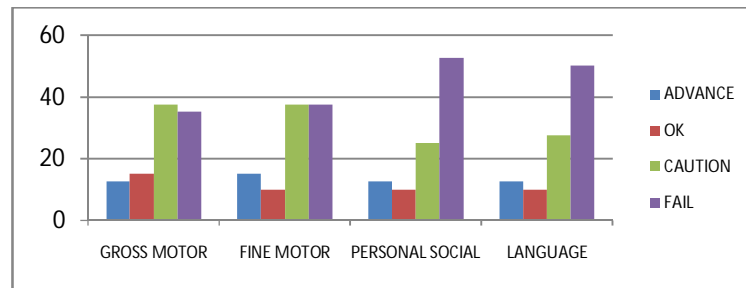


Figure 4: Level of achievement in all domains in Non-Early Interventional (NEI) infants

From the results obtained the following conclusions could be drawn,

The chi-square statistic value for the gross motor, fine motor, personal social & language domains data is =18.37 with a corresponding $P=0.004$. Since 'P' value is <0.05 , the Chi-square statistic is significant and hence the null hypothesis is rejected. It implies that the level of achievement in all domains is influenced by EI therapy. Therefore the interventional therapy is useful in getting higher level of achievement.

It is further proposed to examine whether there is any significant difference between the proportions of LBW infants with regard to each level of achievement in all domains, the 'Z' test for the equality of proportions is used. The null hypothesis to be tested is the proportion with the level of achievement in all domains differs significantly between the EI and NEI. So the null hypothesis is given as $H_0:P_1=P_2$, where P_1 & P_2 refer to the population proportions of the two groups. The following Table 2 gives the 'Z' statistic values with their level of significance as well as the proportion of two groups of infants achieving the desired level of improvement in all four domains

Domains	Interventional (EI) n=60	Non- Interventional(NEI) n =40	z	P1	P2
Gross motor					
Advanced	20	5	2.32*	0.33	0.125
O k	21	6	2.25*	0.35	0.15
Caution	14	15	1.64	0.23	0.38
Fail	5	14	3.41*	0.08	0.35
Fine motor					
Advanced	15	6	1.20	0.25	0.15
O k	25	4	3.41*	0.08	0.35
Caution	12	15	1.97*	0.2	0.37
Fail	8	15	2.85*	0.13	0.37
Personal social					
Advanced	11	5	0.74	0.18	0.125
O k	25	4	3.4*	0.08	0.35
Caution	17	10	0.33	0.28	0.25
Fail	7	21	4.46*	0.116	0.52
Language					
Advanced	10	5	0.56	0.166	0.125
O k	27	4	3.72*	0.45	0.1
Caution	14	11	0.51	0.23	0.27
Fail	9	20	3.77*	0.15	0.5

Table 2: 'Z' statistic values with their level of significance as well as the proportion of two groups of infants achieving the desired level of improvement in all four domains

* Significant

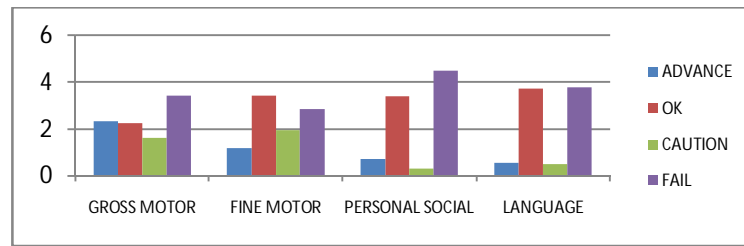


Figure 5: 'Z' statistic values of two groups of infants achieving the desired level of improvement in all four domains

From this table, following conclusions can be drawn.

There is a significant difference in the proportion of infants achieving advanced, ok and fail level of achievement in gross motor domain. But there is no significant difference in the proportion of caution level of achievement.

The % or proportion of babies with advanced level of achievement is higher in the EI group when compared to the same for the NEI group. Therefore the interventional strategy contributes to the level of achievement in gross motor domain. In the case of fine motor, personal social and language domains the difference is not significant between the proportion of the two groups with the advanced level of achievement.

So having advanced level of achievement is found to be a difficult task for even the EI group with regard to fine motor ,personal social & language domains .

5. Discussion

We studied the effects of intensive EI in selected sample of high risk infants from birth to 6months of age. We found differences in neurologic and developmental outcome between EI and NEI infants, with a better performance in EI infants. The study suggests a positive effect of EI on LBW infants.

“Early” can be understood in several ways, for example:1)early after birth;2)early in the first year of life; and 3) early after onset of the condition. Each intervention type is associated with advantages and disadvantages .Very early treatment are intervention provided for infants who are at risk for neuromotor disorders, and treated as soon as possible to minimize future handicaps¹⁷.

CDC model of ‘early stimulation therapy’ was effective. The beneficial effect also persisted at 2 years, without any additional interventions. A reduction of 40% in poor performance could be achieved by EI in LBW babies in Trivandrum¹⁸.Various studies

related to the developmental outcome of LBW infants^{19,20}. EI showed greater developmental progress in acquisition of skills, cognition, intellectual, social functioning and increased weight gain^{21,22,23}.

EI have been carried out in the NICU, after hospital discharge, or may initiate during the first semester of life^{24,25}. But in our study we began EI during newborn period itself before hospital discharge. In our study, we initiated early intervention right from the neonatal period itself and continued during the first 6 months of life by reviewing infants every month in EI group. NEI group were also advised to take EI for their infants, but they did not turn up for early interventional therapy.

In our study in the initial assessment of neurological examination, infants of 86% were suspected of neurologic abnormalities, while 14% exhibited a normal result. Six months later at the second examination, in NEI infants 12.5% present a normal result, while 87.5% had suspicion of neurologic abnormalities. In EI Group, all infants had a near normal result at sixth month. So significant differences between groups were observed with better performance in EI than NEI group

A difference in developmental items was observed when comparing infants under EI group with those of NEI group. The level of achievement in all domains of LBW infants is influenced by the early interventional therapy. It is therefore suggested that the use of early interventional therapy will help in the process of achieving higher level of achievement in different domains of LBW infants. In our study, EI therapy helps in the process of achieving higher level of achievement in gross motor domain, similar studies^{26, 27} is in agreement with our result.

The difference between the proportions of infants with regard to each level of achievement in all domains was examined. In the gross motor domain there is a difference in infants achieving advanced, ok and delay level of achievement. But there is no significant difference in caution level of achievement.

The advanced level of achievement is higher in gross motor domain of EI group when compared to the same for the NEI group. Therefore the interventional strategy contributes to the level of achievement in gross motor domain. In the case of fine motor, personal social and language domains the difference is not significant between the groups with the advanced level of achievement. So having advanced level of achievement is found to be a difficult task for even the EI group with regard to fine motor, personal social & language domains.

We conclude the infants under the caution group both in EI & NEI groups do not show a significant improvement in all the domains except in fine motor.

Our data attributed to the most intensive EI program .Moreover; the training facilitated the mother-infant relationship. It was emphasized that, aside from the training programs, the infant requires the affection and care of the family members.

Although our follow-up time was short, our results hold the promise of good outcome in the neurodevelopment of high-risk infants. In summary, comparison between the EI and NEI LBW infants, the early interventional therapy helps in the process of achieving higher level of functions in different domains.

6.Reference

1. Costello D, Friedman H, Minich N, Siner B, Taylor G, Schuchlter M, Hack M. Improved neurodevelopmental outcomes for extremely low birth weight infants in 2000-2002. *Pediatrics* 2007;119: 37-45.
2. Escobar G, Littenberg B, Petitti DB Outcome among surviving very low birth weight infants: a meta analysis .*Arch Dis Child* Feb1991; 66: 204 - 211.
3. C. F. Martínez-Cruz, A. Poblano, L. A. Fernández-Car-rocera, R. Jiménez-Quiróz and N. Tuyú-Torres, "Association between Intelligence Quotient Scores and Extremely Low-Birth Weight in School-Age Children," *Archives of Medical Research*, Vol. 37, No. 5, 2006, pp. 639-645.
4. Bernbaum, J. C. & Batshaw, M. L (1997). Ch 7. Born too soon, born too small. In *Children with disabilities: A medical primer*. (Eds.). Baltimore: Paul H. Brooks
5. Subramanian S. K.N., Yoon H., & Toral, J.C. (2002). Extremely low birth weight infant. *Emedicine Journal*, 10, (3),
6. T. Kanda, M. Yuge, Y. Yamori, J. Suzuki and H. Fukase, "Early Physiotherapy in the Treatment of Spastic Diplegia," *Developmental Medicine and Child Neurology*, Vol. 26, No. 4, 1984, pp. 438-444.
7. A. Poblano, "Early Identification and Treatment of Infants with Neurologic Damage (in Spanish)," *Editors de Textos Mexicanos*, México City, 2003.
8. M.K.C Nair, *Neurodevelopmental follow up- "Module on Early Stimulation,"* Editors Tanmay R.Amladi, 2004
9. R. Ramos-Galvan, "Pediatric Somatometry. Follow-up Study in Infants and Children from México City," *Archives of Medical Research*, Vol. 6, Supplement 1, 1975, pp. 83-396
10. H. Capurro, S. Konichezky, D. Fonseca and R. Caldeyro- Barcia, "A Simplified Method for Diagnosis of Gestational Age in the Newborn Infant," *The Journal of Pediatrics*, Vol. 93, No. 1, 1978, pp. 120-122
11. S. A. Leib, D. G. Benfield and J. Guidubaldi, "Effects of Early Intervention and Stimulation on the Preterm Infant," *Pediatrics*, Vol. 66, No. 1, 1980, pp. 83-90; Glass, 2005; Gray & Philbin, 2004; Graven, 2004
12. H. Benavides-González, M. A. Rivera-Rueda, M. P. Ibarra-Reyes, M. E. Flores-Tamez, A. Fragoso-Ramírez, N. Morán-Martínez and L. A. Fernández-Carrocera,

- “Effects of Early Multimodal Stimulation on Premature Newborn Infant,” Boletin Medico del Hospital Infantil de Mexico, Vol. 46, No. 12, 1989,789-795.
13. Amiel-Tison C, Grenier A (Eds) Neurological assessment during the First year of life. New York: Oxford University press 1986:96-145
 14. Denver Developmental Materials, Inc, PO Box6919, Denver, Colorado 80206/9019 ;(303) 355-4729
 15. Physical & developmental assessment of the child. Clinics in physical therapy-physical therapy assessment in early infancy-edited by Irma J. Wilhelm
 16. Mood, A.M., F.A. Graybill, & D.C.Boes (1964), Introduction to the theory of statistics, Mc graw Hill, 3rd edition
 17. Masi. W. Supplemental stimulation of the premature infant. In: Field TM, ed. Infant born at risk .Behaviour and Development .New York, Spectrum publication 1979.367-387
 18. 20. Nair MKC, Early stimulation CC Trivandrum Model. Indian J Pediatrics; 1992; 59:663-
 19. Hack, M. & Sanaroff, A. (1999). Outcomes of children of extremely low birth weight and gestational age in the 1990's. Early Human Development, 53, 193-218.
 20. Singer, L.T., Siegal, C., Lewis, B., Hawkins, S., Yamashita, T., & Baley, J.(2001). Preschool Language Outcomes of Children with History of Bronchopulmonary Dysplasia and Very Low Birth Weight. Journal of Developmental & Behavioral Pediatrics, 22, (1), 19-26
 21. SharkeyMA,PalitzME,ReeceLF,RutherfordBL,The effect of early referral &intervention on developmentally disabled infants: evaluation at 18 months of age ;JAM Board Fam pract 1990,jul-sep;(3):163-70
 22. Raney CT, Smith BJ; Assessing the intellectual consequences of early intervention with high risk infants ;AMJ Ment Defic1977 jan;81(4):318-214
 23. Field TM, Schanber SM, Scafidi F, Bauer CR ,Yega-Lahr N ,Garcia R, Nystrom J &Kuhn CM 1986 Tactile / Kinesthetic Stimulation effects on preterm neonates,Paediatrics,7(5),654-658
 24. A.D.Rothberg,M. Goodman, L. A. Jacklin and P. A. Cooper, “Six-Year Follow-up of Early Physiotherapy Intervention in Very Low Birth Weight Infants,” Pediatrics, Vol. 88, No. 3, 1991, pp. 547-552.

25. M. E. Barrera, C. E. Cunningham and P. L. Rosenbaum, "Low Birth Weight and Home Intervention Strategies: Preterm Infants," *Journal of Developmental and Behavioral Pediatrics*, Vol. 7, No. 6, 1986, pp. 361-366
26. M. E. Barrera, C. E. Cunningham and P. L. Rosenbaum, "Low Birth Weight and Home Intervention Strategies: Preterm Infants," *Journal of Developmental and Behavioral Pediatrics*, Vol. 7, No. 6, 1986, pp. 361-366.
27. Cameron EC, Maehle V, Reid J: The effects of an early physical therapy intervention for very preterm, very low birth weight infants. A randomized controlled clinical trial. *Pediatr Phys Ther* 2005, 17:107-119. PubMed Abstract | Publisher Full Text