Original Research Paper

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Occupational Therapy

EFFECTIVENESS OF PARENTAL EDUCATION BASED ON NEUROBEHAVIOURAL CUES AND IT'S IMPACT ON PRETERM INFANT DEVELOPMENT.

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ABSTRACT

Background: The transition from the well supported and resourceful NICU to the home setting is really a demanding time for the families. Post discharge care by parents can have nurturing or direct toxic effect on the brain. Therefore it is important that a new parent mostly those whose is the first child i.e. to preterm baby, tune in quickly to what overwhelms her baby and learn to read the cues of the preterm baby before he/she overloads, to protect the development of brain and avoid the long term neurodevelopmental deficits.

Objective:

- To observe for caregiver's response to various infant neurobehavioral cues and to categorize infant's self-regulatory competence.
- To assess the overall development of the infant with the Bayley Scale of Infant Development (BSID III).

Study design: Prospective, Experimental, Interventional, Comparative and Matched Subjects Design. **Methods:** All the participants of the study were explained in detail about the study protocol and were notified regarding the camera surveillance and accordingly consent was taken from the caregiver. Administrative permission was taken for installation of camera and accordingly privacy guidelines were made such as automatic deletion of stored data within 15 days. Investigator observed the video recording, analyzed it and the infant competence level was noted using the Infant Behavior Assessment tool (IBA) and depending on the competence level the facilitation strategies were explained to the caregiver. **Results:** There was significant improvement in the Self-regulatory competence and Developmental functioning of preterm infant in all the domains of BSID III (Cognitive, Language, Motor, Social-Emotional and Adaptive Behaviour) after parental education. **Conclusion:** Parental education about their infant's neurobehavioral cues, create optimal conditions for their infant development and enhance the infant's self-regulatory competence.

KEYWORDS : : Preterm infant, Neurobehavioural cues, IBAIP, BSID III parent education.

INTRODUCTION:

According to World Health Organization (WHO) "Preterm birth is defined as babies born alive before 37 weeks of pregnancy are completed". Every year an estimated 15 million babies are born premature, i.e. 1 in 10 babies and this number is rising with risk of neurodevelopmental and behavioral disabilities high in children and in adults who were born preterm. As more infants are surviving, the importance of finding ways to improve developmental outcomes and their quality of life becomes paramount. Many of the preterm infant once discharged from hospital NICU continues to lack well organized central nervous system and thus fail to provide predictable, clear behavioral cues that assist parents to respond in a manner that will produce organized responses in their baby and support their infant's self-regulatory efforts and/or competence (Als, 1999; Brazelton & Greenspan, 2000). This in turn may make it more difficult for the parents to form a relationship with their infant. The transition from the well supported and resourceful NICU to the home setting is really a demanding time for families Post discharge care by parents can have nurturing or direct toxic effect on the brain. Therefore it is important that a new parent mostly those having such first child i.e. to preterm baby, tune in quickly to what overwhelms her baby and learn to read the cues before he/she overloads, to protect the development of brain and avoid the long term neurodevelopmental deficits.

NEED OF THE STUDY:

In India there is no study reflecting the developmental care, post NICU discharge. Herein we observe that the environment suitable for preterm infant development post discharge is out-off control because parents have to take their baby for repeated follow up to hospital setup every now and then, and travelling is itself the barrier for neuroprotection of the infant. Similarly behaviour of the other family members towards infant differs according to culture, due to which the infant's brain may get stressed and also thus there is need to empower parents about the infant's cues and accordingly respond to it. Considering all this, there was need to study the effect of short-term, home based intervention with parents and their premature infants in form of parental education based on the Infant Behavioral Assessment and Intervention Program (IBAIP) designed to support infants with developmental risk in Indian Context

Aim: To study the effectiveness of parental education based on neurobehavioral cues and its impact on preterm infant development.

Objective:

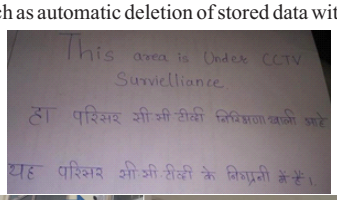
- To observe for caregiver's response to various infant neurobehavioral cues and to categorize infant's self-regulatory competence.
- To assess the overall development of the infant with the Bayley Scale of Infant Development (BSID III).

METHODOLOGY:

The Principal investigator and the Co-investigator presented the entire protocol to the Neonatologists, Paediatricians, Nurses and the Occupational therapist and explained the importance for the need of the study. All the participants of the study were explained in detail about the study protocol and a written informed consent was taken.

A. Experimental group:

The first initial and follow up sessions were taken in the occupational therapy department. Participants who came to occupational therapy set up for initial assessment those participants were asked to interact with their infant (infant in awake state) for 15-20 min and this interaction was video recorded. Few of the participants who were unable to follow up in occupational therapy dept. for initial assessment due to follow up in more than 1 OPD in a day and also long distance travelling for those self-regulatory competence was assessed on IBA directly by the investigator and not under video recording in KMC setting. Parents were notified regarding the camera surveillance and accordingly consent was taken from the caregiver. Administrative permission was taken for installation of camera and accordingly privacy guidelines were made such as automatic deletion of stored data within 15 days.



The above image shows the installed camera in occupational therapy dept. for the purpose of the study.

Investigator observed the video recording, analyzed it and the infant competence level was noted using the Infant Behavior Assessment tool (IBA) and depending on the competence level the facilitation strategies were explained to the caregiver.

INTERVENTION PROTOCOL:

The participants received parental education about expression of approach, stress and self-regulatory behaviors of infant arising from 4 subsystems of communication (autonomic, motors, state, attention/interaction) through video recording analyzation, pictorial presentation, pamphlets, written and verbal instructions and demonstration once a week for three months. Based on the level of regulatory competence, following Facilitation strategies were offered to the preterm infants and explained to the caregiver to support infant's subsystem balance and self- regulatory efforts.

1. **Optimal Self- Regulatory Competence:** Facilitation: occasionally required.
2. **High Self-Regulatory Competence:**
   Facilitation Required: Low support.

- Infant need a mild degree of facilitation.
- Positioning the hand to midline/stomach.
- Provide firm pressure on infant stomach/midline through the caregiver's hand.
- Place infant's hand in midline upon caregiver's hand.
- Infant's shoulders are contained using deep pressure to upper and side region of the shoulder.

3. **Moderate Self-Regulatory Competence:**
   Facilitation: Moderate support

- Infant need a moderate degree of facilitation.
- Positioning both of the infant hand in midline
- Both of the infant's hand is positioned in midline upon the caregiver's hand.
- Facilitate infant's shoulder in flexion supported by towel rolls.
- Position the infant in an upright sitting position with help of small wedge.
- Partially swaddle the infant by wrapping the upper part of the body with the blanket.
- Additional facilitation required is:
- Ambient visual environment (dim light)
- Ambient auditory environment (low music,)

4. **Low Self- Regulatory Competence:**
   Facilitation: High support

- Infant need a high degree of facilitation
- Swaddling is used to support and maintain upper and lower extremity in flexion
- Infant feet are held or provided with bracing surface
- Infant cradled in caregivers arm to support upper/lower extremity in flexion
- Infant swaddled and cradled on caregivers lap.
- Infant swaddled and cradled in caregivers arm.

5. **Minimal Self-Regulatory Competence:**
   Facilitation: Termination of interaction
   Provide maximal support for infant to return to subsystem balance.

Additional to it, following facilitation technique was explained:

Environmental facilitation:

- Ambient visual environment (e.g. Feeding in dim light. Exposure to rhythmic low level ambient lights for entrainment of circadian rhythm, prevention of eyes from direct light exposure)
- Ambient auditory environment (conversation away from infants, low music, avoid screaming/shouting near to infant etc.)
- **Temperature within environment.**

Motoric facilitation (positioning/handling):

- Supine: upper/lower extremity and trunk
- Prone: upper/lower extremity and trunk
- Side lying
- Cradled in arms
- Held on caregivers shoulder
- Held face to face on caregivers lap.

` **Cue matched facilitation:**

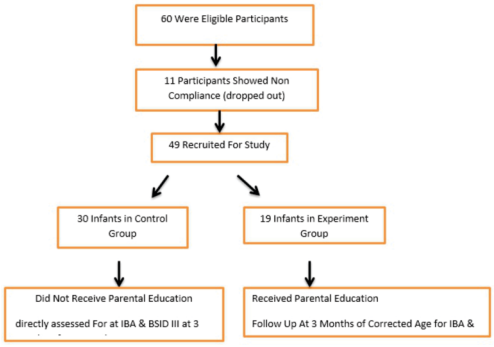
- Hand to mouth, sucking, mouthing
- Bracing and foot clasp
- Holding on Hand to midline, hand to stomach

And at 3 months of corrected age, the final day assessment was done using **Infant Behavioural Assessment** for self-regulatory competence level of the infant and **Bayley Scale of Infant Development (BSID III)** was used to find the overall development of the infant post intervention. Scoring Of The Bayley Scale of Infant Development (BSID III) Was Done By Certified Principal Investigator.

B. Control group:

Preterm infant who was already at 3 months of corrected age, and were on standard care of intervention in KMC, with no opportunity of providing parental education related to behavioral cues were assessed for self- regulatory competence and overall development using Infant behavioral assessment and the Bayley Scale of Infant Development (BSID III) respectively.

RESULTS :



COMPARISON OF BSID III SCORES BETWEEN THE GROUPS:

DOMAINS OF BSID III	GROUP	MIN	MAX	MEDIAN	MEAN RANK	P-value
COGNITIVE	CONTROL	1	3	2	19.4	0.000
	EXPERIMENTAL	2	3	3	33.84	
LANGUAGE	CONTROL	1	3	2	21.88	0.013
	EXPERIMENTAL	2	3	2	29.92	
MOTOR	CONTROL	1	3	2	19.78	0.001
	EXPERIMENTAL	1	3	3	33.24	
SOCIAL EMOTIONAL	CONTROL	1	3	3	22	0.013
	EXPERIMENTAL	2	3	3	29.74	
ADAPTIVE BEHAVIOUR	CONTROL	1	3	2	20.6	0.002
	EXPERIMENTAL	2	3	3	31.95	

Table No 1: Comparison of Self-Regulatory competence level between the groups at 3 months of corrected age:

INFANT BEHAVIOUR ASSESMENT(IBA) POST					
Group	Min	Max	Median	Mean rank (Mann Whitney test)	P- value
Control	1	3	2	22.15	0.036
Experimental	1	3	3	29.5	

The **P-value of 0.036** signifies that the results are significant in favour of experimental group.

Secondary findings:

Table 2: Comparison of Pre and Post Self-regulatory competence in the Experimental group.

INFANT BEHAVIOUR ASSESMENT(IBA) PRE AND POST						
Experimental Group	Min	Max	Median	Negative rank	Positive rank	Ties
PRE IBA	1	3	2	0	11	5
POST IBA	1	3	3			

Wilcoxon signed rank: P-value is 0.001

As P-value is 0.001 it shows the highly significant improvement in regulatory competence of preterm infant post intervention.

DISCUSSION:

Effect on self-regulatory competence:

In our study it was observed through the results and tables that Infant Behavior Assessment showed significant improvement as p-value of 0.036 ($p \leq 0.05$) in favor of experimental group, i.e. there was improvement in the self-regulatory competence of preterm infant after parental education as the parental knowledge of understanding their infants' neurobehavioral cues supported the infant's individual self-regulatory competencies and provided the environment the infant expected. This enhanced the infant's information processing and exploratory abilities. During early infancy period, the sensory-motor system plays a key role in the explorations as well as in self-regulation. Hence, these positive early experiences to the preterm infant provided by their parents may have influenced the organization of the brain after the intervention period and thus contributed in overall brain development. We hypothesize that the parental education, in which parents are sensitized to their infant's behaviors created optimal conditions for their infant development and also enhanced the infant's self-regulatory competence, which in turn benefited the overall development.

Looking at the self-regulatory competence of the preterm infant in our study it appeared that intervention infants, at 3 months of corrected age were able to draw readily upon self-regulatory strategies during the course of intervention as they displayed more of approach behavior with only less stress behavior. The self-regulatory behavior of the infants in the control group was less successful, i.e. They continued to be poorly organized as compared to experiment infants.

Effect on Overall Development:

Our other goal was to check the effectiveness of parental education on the overall preterm infant development and this overall neurodevelopment was assessed using the Bayley Scales of infant development. We found that parental education showed statistically significant improvement in developmental functioning in all the domains as seen on BSID III of the preterm low birth weight infants in favor of the experimental group at 3 months of corrected age, as Parents appeared confident to provide the necessary co-regulatory support (i.e. Handling and positioning, environmental, or cue-matched strategies) that enabled their infant to be engaged with their environment and the people within it. As parental education aimed at neuroprotection of their preterm infant, this neuroprotection intervention must have enhanced the development of more normal experience for their infant and may have resulted in improved neuronal connections and enhanced neuronal synaptic development thus supporting the neurobehavioral organization of the infant. However, these variations of significance in the positive findings of the overall development lack the predictability of what part of intervention, i.e. the facilitation strategies or modification of environment must have enhanced which part of the brain development. Thus parental education have encouraging effect on mental and motor development in most of the preterm infant, and it may contribute to the early resilience and neurodevelopmental outcome of low birth weight preterm infants after discharge from hospital .

Additional findings:

Additional to it we compared the pre and post infant self-regulatory competence in experimental group and it was observed through the results and tables that there is very high significant difference in post experimental group as p-value was 0.001($p \leq 0.001$).

Along with it, it was observed through the course of study that this mindful attention of parents/caregivers to their infant behavioral expression and development fostered parent infant interaction and also enhanced parents feeling of joy and confidence.

We did not consider the cultural aspect during planning the study, But the study population was from the different cultural background. Despite cultural diversity positive results were found. This can be explained by the fact that the brain has immense ability to overcome and compensate for the barriers. To some extent the effect of cultural diversity may have counterbalanced because of this.

LIMITATIONS:

- The Irregular follow up of the Parents for the Study due to long distance travelling.
- The study cannot be generalized as the sample size was small.

CONCLUSION:

The present study was conducted to check the effectiveness of the parental education based on infant behavioral assessment and intervention program (IBAIP) on preterm infant neurodevelopment at 3 months of corrected age.

And the results of this study indicate that the parental education based Infant Behavioral Assessment and Intervention program to understand behavioral cues of preterm infant is a potentially useful program, as it did not show any detrimental effects on preterm infant development and even reduced stress and increased self-regulatory competence of preterm infant at 3 months of corrected age.

So we conclude that the parental education , in which parents are sensitized to their infant's behaviors or cues , create optimal conditions for their infant development and enhance the infant's self-regulatory competence, which in turn benefited development.

These study results warrant further evaluation in a randomized controlled trial, with long-term follow-up.

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