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Original Research Article

EVALUATION OF IAP – EARLY CHILDHOOD DEVELOPMENT MODULE ON GROWTH AND DEVELOPMENT OF INFANTS BETWEEN 0-2 YEARS IN SANGAREDDY DISTRICT

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ABSTRACT

Background: During the first thousand days of life (from conception to the second year), the brain, goes through 90% of its important development. This period is pivotal for cognitive, immune, digestive, and metabolic development, with long-term implications for health and productivity. Many parents are ignorant of the fact that in order to promote good synaptogenesis and overall brain development, their children need certain foods and stimulation. The IAP-Early Childhood Development (ECD) module aims to address this gap through structured parental interventions. To evaluate the impact of the IAP-ECD module on the growth and developmental outcomes of infants aged 0-2 years in Sangareddy district.

Materials and Methods: One hundred term healthy babies (≤1 week old) were participated in this prospective experimental study; fifty were born intramurally at MNR Medical College (intervention group), and fifty were born extramurally (control group). The intervention group received neuronal stimulation education through the IAP-ECD module, with eight scheduled well-child visits for growth and development monitoring. The control group attended standard health check-ups. Growth metrics (weight, height, head circumference) and developmental quotients were assessed using the Denver Developmental Screening Test II (DDST-II) and Developmental Assessment Scales for Indian Infants (DASII).

Results: The intervention group exhibited significantly higher mean weight, height, and head circumference ($p<0.05$). Developmental quotients in gross motor, fine motor, language, and social communication domains were also significantly higher in the intervention group at 6, 12, and 18 months ($p<0.05$). Exclusive breastfeeding rates increased within the intervention group, with a notable reduction in formula feeding and sickness episodes compared to controls.

Conclusion: The IAP-ECD module improves the development and growth of newborns through specific dietary and neuronal stimulation. These findings advocate for integrating structured parent education and early developmental interventions in order to help children thrive in the first thousand days of life.

Keywords: Early Childhood Development, Brain Development, Infant Growth, Developmental Quotient, Parent Education, Synaptogenesis.

INTRODUCTION

The brain is the only organ not completely formed at birth. 90% of crucial brain development happens during the first 1000 days (from conception to the second year of life). The genes serve as the foundation and atmosphere we create as parents is

the architect. We should endeavour to provide the optimal diet and environment for brain development.[1,2]

First 1000 days is considered to be most critical & sensitive period of human life in which the foundations of future health, well-being and productivity are laid down. It is a period of rapid growth and a time of significant development viz cognitive development, immune maturation, development of digestive system, metabolic organs & body composition, with impact on health in later life.[3,4]

Though brain constitutes 2 % of body weight, it controls 98 % of our bodily functions acting as Control Room. It has a fixed 80-100 billion neurons at birth and each neuron has the capacity to form 1000 -10000 synapses. 40000 synapses active per second in early days with Transfer of signals at the rate of 120 m/sec. Brain is most sensitive to positive & negative environmental inputs and experiences build brain architecture (Experience dependent synapse formation).[5,6] Out of 1000 trillion connections a brain can form by 2 years, 500 trillion connections happens in first six months, making it most sensitive period using the phenomenon Use it or Lose it. Most of the parents are not aware of this great potential and not stimulating the right way for Synaptogenesis.

According to Lancet 2016, it was estimated that 200 million children under 5 yrs of age do not develop to their full cognitive potential. This has lifelong implications and adverse consequences for education, income, health, fertility rates & delinquency and jeopardizes the development and wellbeing of future generation.[7-9] Early child development (ECD) interventions are usually seen as cost effective and promising strategies for reaching children at risk and for influencing success and productivity up to adult age. The circumstances of poor households often result in less stimulation, parent child interaction and stability. Similarly, deprivation in early childhood is believed to negatively affect IQ development, which affects other ECD markers, such as motor skills. Providing the right stimulation at the right time is the key for brain development. Home based interventions can help to alleviate the negative effects of poverty on child development, thereby preventing a widening of the gap between rich and poor.[10,11]

High quality Structured Parent intervention programs like IAP NC ECD MODULES that include recurrent health care provider- caregiver interactions using multiple modalities to engage parents in providing nurturing care at home are associated with good child and parent outcomes.[12-14] This study designed to evaluate the impact of IAP-early childhood development module on growth and development of infants between 0-2 years in Sangareddy district, Telangana.

MATERIALS AND METHODS

This prospective experimental study was carried out in the Department of Pediatrics, MNR Medical College and Hospital, Sangareddy, from December 2022 to May 2024. We included 100 term healthy newborns under one week of age, equally from MNR Medical College and Hospital (n = 50) and five from Anganwadi (n = 50). We excluded preterm babies, newborns with asphyxia, seizures, any neurodevelopmental anomalies, metabolic disorders, or congenital anomalies, and newborns of mothers with medical illnesses requiring hospitalization in the neonatal period. We obtained informed consent from parents or guardians. The institutional ethics committee approved the study protocol.

Newborns were divided into two groups. In the intervention group, we enrolled and followed up 50 babies born intramural, or at MNRMCH. In the control group, we enrolled and followed up 50 babies born extramural, or outside hospitals, who visited five Anganwadi centers. We sensitized mothers and caregivers to exclusive breastfeeding in the first 6 months and engaged them in stimulating activities during this period. Every month, we carried out follow-ups to evaluate growth, such as height, weight, head circumference, and development. We also evaluated milestone achievement and development quotient using the DDST-II (Denver Developmental Scale) and DASII. The IAP NC-ECD Module's structured protocol, which included posters, educational pamphlets, and MCP cards in local language, guided the planning of nine well-child visits in the intervention group (7). We employed various tools to evaluate the study parameters, including an electronic weighing scale for weight, an infantometer for newborn length, a measuring tape for head circumference, and the Denver Development Scales II and developmental assessment scales of Indian infants (DASII) for newborn development.

The data were entered in an Excel sheet and analyzed using SPSS v23.0 operating on Windows 10. We summarized the data as mean, standard deviation, frequency, and percentage. We used an unpaired t-test to compare the continuous data. For all statistical purposes, a p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Anthropometric and clinical profile of study participants

Anthropometric profile	Intervention group	Control group	p-value
	Mean ± SD	Mean ± SD	
Weight			

0-6 months	9.3±1.2	8.5±2.1	0.01
6-12 months	11.6±1.6	10.1±2.3	0.01
12-18 months	13.1±2.1	11.2±2.1	0.01
Height			
0-6 months	70.1±1.2	61.6±0.96	0.01
6-12 months	77.6±1.01	68.1±1.32	0.01
12-18 months	85.1±0.96	75.62±1.10	0.01
Head circumference			
0-6 months	42.11±0.82	41.12±0.72	0.01
6-12 months	45.75±0.6	44.31±0.68	0.01
12-18 months	47.66±1.01	45.81±0.91	0.01
Mid arm circumference			
0-6 months	12.2±0.52	12.11±0.31	0.65
6-12 months	12.3±0.36	12.2±0.62	0.41
12-18 months	14.77±0.32	14.61±0.21	0.89

Table 2: Comparison of feeding type, vaccination status among study participants

Parameter	Intervention group	Control group	p-value
	Mean ± SD	Mean ± SD	
Children with sickness episodes			
Present	4 (8%)	18 (36%)	0.01
Absent	46(92%)	32 (64%)	
Status of first 6 months feeding			
Formula feeding	5 (10%)	13 (26%)	0.12
Breast feeding	45 (90%)	37 (74%)	
Vaccination status as per NIS			
Vaccinated	49 (98%)	47 (94%)	0.32
Vaccine discontinued	1 (2%)	3 (6%)	

Table 3: Comparison of developmental quotient between the groups at different age intervals

Development quotient	Intervention group	Control group	p-value
	Mean ± SD	Mean ± SD	
At 6 months			
Gross motor	90.5±1.63	86.33±2.1	0.01
Fine motor	98.11±1.21	86.92±0.91	0.01
Language	90.6±1.1	87.21±0.9	0.05
Social and communication	89.91±0.92	87.87±1.1	0.01
At 12 months			
Gross motor	89.7±1.21	86.87±1.3	0.01
Fine motor	90.81±1.1	86.3±0.62	0.01
Language	90.12±0.98	87.51±0.94	0.05
Social and communication	89.65±1.21	87.62±1.33	0.01
At 18 months			
Gross motor	90.85±1.2	86.66±1.32	0.01
Fine motor	89.91±1.01	87.22±1.21	0.01
Language	89.9±1.3	87.51±1.05	0.05
Social and communication	89.3±1.2	86.3±1.32	0.01

DISCUSSION

Early childhood is vital for physical growth, future productivity, and mental wellbeing; adversities can impact the whole life of the individual and society.[15] Proper nutrition and timely neuronal stimulation during this critical period lay the foundation for long-term health and intellectual abilities. According to Lancet report 2017, nearly 250 million children under the age of five years were not attain their predicted developmental potential in middle- and low-income countries.[16] The IAP-Early Childhood Development (ECD) Module aims to address these needs by integrating enhanced nutritional guidelines and structured stimulation activities to optimize early development. This study explores the impact of the IAP-ECD Module on the growth and development of infants aged 0–2 years.

Children in the study group, who were engaged in brain stimulation activities, showed significantly higher mean weights compared to the control group. The statistical analysis using a t-test revealed that the weight gain in the study group was significant. [Table 1] These results align with findings from earlier studies, particularly those conducted in Jamaica, which demonstrated a positive impact of enhanced nutrition on child weight gain.[15,17,18] Moreover, a study known as the PEDS trial in Pakistan revealed that the intervention not only facilitated substantial weight gain but also assisted mothers in coping with postpartum depression and resolving baby care concerns. This method has shown to be more effective although its benefits on developmental outcomes remain somewhat unclear.[19]

Our study also found that children in the study group had greater height gain compared to those in the control group, who did not receive neuronal

stimulation guidance. The t-test analysis confirmed that the height gain in the study group was significant. This finding is in line with observations from Jamaican studies that underscored the beneficial effects of enhanced nutrition on child height gain. Similarly, the PEDS trial in Pakistan documented significant height gains, with the intervention also helping mothers to manage postpartum depression and better understand baby care.[17,18,20,21]

Significant differences were also noted in the mean head circumference between the groups. Children in the study group, who received enhanced nutrition and brain stimulation, had significantly larger head circumferences compared to the control group. The t-test confirmed that the head circumference in the study group was notably greater, suggesting enhanced brain development. There is a strong correlation between skeletal growth, fat accumulation, and increases in head volume. Despite this general proportionality, each of these parameters follows distinct growth patterns. Post the age of two, head volume grows independently of skeletal and fat growth, indicating that head circumference is a reliable, quick, and cost-effective indicator of normal brain size and growth, especially in young children.[22,23]

Children in the study group also exhibited a significantly higher Development Quotient compared to the control group. The t-test indicated a significant increase in the Development Quotient for the study group. These results are consistent with findings from the PEDS trial in Pakistan, where the intervention aided mothers in coping with postpartum depression, improving their understanding of baby care, and engaging in effective stimulation activities, all contributing to enhanced developmental outcomes. Furthermore, integrated child development activities in Jamaica demonstrated that enhanced nutrition positively influenced the Development Quotient. Comparative PET scans of neglected children in Romania revealed significant differences in brain size, with neglected children showing substantially smaller brains, cortical atrophy, larger ventricles, and lower Development Quotients.[17,18,20] Environmental stimulation promotes early synapse maturation and more efficient communication, which is crucial for brain development. Nutritional deficiencies, including severe acute malnutrition, chronic undernutrition, iron deficiency, and iodine deficiency, can impair brain development.[24,25] While strategies such as salt iodization and micronutrient powders have shown improvements in these conditions, direct evidence of their impact on brain development is limited. Nevertheless, salt iodization, coupled with adequate intakes of energy, protein, and vitamins, has been shown to enhance mental performance in Filipino schoolchildren. Achieving normal iodine status and eliminating protein-energy malnutrition have longer-term benefits for improved performance and brain development.[26-28]

CONCLUSION

The IAP-Early Childhood Development Module, which focuses on improved nutrition and neural stimulation, greatly improves newborns' physical growth and developmental milestones. The intervention's efficacy in increasing weight, height, head circumference, and other developmental quotients highlights the importance of early and comprehensive care in promoting optimum growth and development in the first two years of life. These results encourage the incorporation of such modules into conventional paediatric treatment to promote young children's holistic development.

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