TEXAS WOMAN'S UNIVERSITY

THE NEUROLOGICAL DIFFERENCES IN DEVELOPMENT BETWEEN PRETERM AND TERM BABIES

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Background and Aim

Preterm birth, defined as birth before the thirty-seventh week of gestation, can place extensive stress on parents and caregivers. Outside the concern of the health of the child and mother, concerns over the developmental delays of the preterm baby can arise. This research is a review of the current literature on the neurological differences in development between preterm and term birth, as well as potential interventions to reduce the significance of developmental delays.

Purpose

The importance of early intervention to prevent neurological developmental delays has been well documented. It is critical that parents be informed of potential delays and intervention techniques to aid in the development of the child. Therefore this research is intended to educate on the neurological differences in development shown in preterm infants and provide information on the interventions to aid in the prevention of developmental delays.

Methods

12 studies were included in this review with 5 studying developmental delays, 3 studying neurodevelopmental disorders, 2 studying interventions, and 2 studying early detection. A total of 3566 children were included in this review with 2054 were born preterm with a mean gestational age of 28.8 weeks gestation and an mean age of 3.6 years at time of study. The most common Assessment used for developmental delays was the Bayley Scales of Infant and Toddler Development-Third Edition and the most common used assessment for behavior was the Child Behavior Checklist.

Results

Developmental Delays

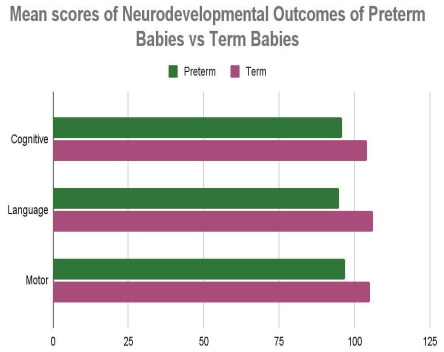
- Cognitive scores were an average 8.3 points lower for preterm children [mean (SD) 95.8 (7.05) vs. 104.1 (7.39)]
- Language scores were an average 11.2 points lower for preterm children [mean (SD) 94.9 (4.71) vs. 106.1 (6.93)]
- Motor scores were an average 8.2 points lower for preterm children [mean (SD) 96.9 (5.76) vs. 105.1 (7.53)]

Neurodevelopmental Disorders

- An average of 6% of the preterm children had developed Cerebral Palsy compared to <1% of the term children
- Preterm children were found to have a 2 to 3 times higher chance of being diagnosed with Attention-Deficit/Hyperactivity Disorder and Autism Spectrum Disorder

Developmental Delay	Preterm (n=826)	Term (n=769)
Cognitive		
Mean (SD)	95.8 (7.05)	104.1 (7.39)
Prevalence of Delay	19%	12%
Language		
Mean (SD)	94.9 (4.71)	106.1 (6.93)
Prevalence of Delay	25%	12%
Motor		
Mean (SD)	96.9 (5.76)	105.1 (7.53)
Prevalence of Delay	31%	8%
Cerebral Palsy		
Prevalence	6%	0%

Neurodevelopmental Disorder	Preterm (n=367)	Term (n=329)
Attention-Deficit/ Hyperactivity Disorder		
Prevalence	19%	7%
Autism Spectrum Disorder		
Prevalence	6.65%	2.83%



Interventions

- Interventions that mimic the intrauterine environment is most effective before term age
- Kangaroo Care can benefit development
- Intervention of any type before term age has some benefit on cognition
- General developmental programs after term age have positive effects on motor and cognitive development

Assessments

- Bayley Scales of Infant and Toddler Development-Third Edition
- Ages and Stages Questionnaire-Third Edition
- Parents' Evaluation of Developmental Status
- Survey of Well-being of Young Children: Milestones

Detection

- Diffusion MRI using a deep learning convolutional neural network model had mean accuracy of 73% of predicting future motor impairments and identifying associated brain regions
- Multimodal model using information from the brain had a significant impact on the prediction of death or neurodevelopmental impairment in extremely preterm infants

Discussion

- Preterm birth has been associated with many developmental delays and neurodevelopmental disorders
- Many of the studies found a correlation between gestational age and the severity and prevalence of delays and disorders, with the earlier the birth the higher the severity
- Early detection and intervention is crucial in lowering the impact or preventing delays
- New and exciting research utilizing advancements in technology is showing promise in the early detection of future motor impairments

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