News and Views

Kangaroo Mother Care Had a Protective Effect on the Volume of Brain Structures in Young Adults Born Preterm

The protective effects of Kangaroo mother care (KMC) on the neurodevelopment of preterm infants are well known however the persistence of its benefits beyond infancy is not known. A recent study determined whether providing KMC in infancy affected brain volumes in young adulthood.

Standardized cognitive, memory and motor skills tests were employed to determine the brain volumes of 20-year-old adults who were enrolled in this randomized controlled trial of KMC versus incubator care.

The results were as follows:

- A total of 178 adults born preterm were included in the study of which 97 had received KMC while 81 were incubator care controls.
- The bivariate analysis demonstrated larger volumes of total grey matter, basal nuclei and cerebellum in individuals who had received KMC, along with better organized white matter, indicating that the volumes of the main brain structures associated with intelligence, attention, memory and coordination be larger in the KMC group.
- A direct relationship between brain volumes and duration of KMC was shown by multivariate linear regression analysis after controlling for potential confounders.

Thus this study demonstrated the neuroprotective effects of KMC for preterm infants to persist even beyond childhood and improve their lifetime functionality and quality of life.

(Source: Acta Paediatr. 2022;111(5):1004-14.)

Newborn Infant Skin Gene Expression: Remarkable Differences Versus Adults

At birth, human infants are suspended to endure harsh, hostile conditions. Understanding the state of newborn skin development and maturation is crucial to maintaining health; optimize response to injury, healing and disease. A recent observational study gathered full-thickness newborn skin samples from 27 infants at surgery and compared them to skin samples from 43 adult sites protected from ultraviolet radiation exposure, as the standard for stable, mature skin. Transcriptomics profiling and gene set enrichment analysis was conducted. Statistical analysis based on more than 25,000 differentially regulated probe sets, symbolizing 10,647 distinct genes, in infant skin compared to adult skin.

Gene set enrichment analysis demonstrated a significant increase in 143 biological processes in infant skin, then adult skin samples, including extracellular matrix (ECM) organization, cell adhesion, collagen fibril organization and fatty acid metabolic process. Biological processes like ECM organization and ECM structure organization in infant skin showed the lowest adjusted P-value. Overexpression of Genes concerning epidermal development, immune function, cell differentiation, and hair cycle were seen in adults, designating 101 significantly enriched biological processes. The processes like skin and epidermal development, e.g., keratinocyte differentiation, keratinization and cornification intermediate filament cytoskeleton organization and hair cycle had the highest significant difference. Enriched Gene Ontology (GO) biological processes also included immune function, along with antigen processing and presentation. On comparing ultraviolet radiation-protected adult skin, these results furnish an essential understanding of infant skin and its proficiency to support the newborn's preparedness to survive and flourish, despite the infant's new environment burdened with microbes, high oxygen tension and potential irritants. This fundamental knowledge may guide strategies to protect and preserve the features of unperturbed, young skin.

(Source: PLoS One. 2021;16(10):e0258554.)

Evaluation of Child Undernutrition Anthropometric Indicators Across Low- and Middle-Income Countries

The United Nations' Sustainable Development Goal Target 2.2 aspires to end all forms of malnutrition by 2030 by meeting targets, along with eliminating stunting and wasting in all children younger than 5 years. These indicators are used to monitor childhood undernutrition but may not supply a complete picture at a population level.

The present study compared global estimates of the prevalence of undernutrition using conventional

indicators of anthropometric failure ([AF]; stunting, underweight, and wasting); the composite index of anthropometric failure (CIAF); and a proposed classification system called categories of anthropometric failure (CAF). It also investigated the association of the conventional indicators, CIAF, and CAF with diarrheal disease as an assessment of the validity of each measure.

The study utilized the data of children from 56 low- and middle-income countries extracted from the nationally representative Demographic and Health Surveys. A total of 5,30,906 children younger than 5 years were included.

Undernutrition defined by conventional indicators (stunting, underweight, and wasting), the CIAF, and the proposed CAF classification system was assessed and compared. Six logistic regression models were employed to investigate the association between different classifications of AF and morbidity.

The results were as follows:

- 5,30,906 children with a mean age of 29.0 months, and 51.3% boys and 48.7% girls from 56 low- and middle-income countries were included in the analysis.
- Estimates of undernutrition developed using the conventional indicators of stunting, underweight, and wasting were found to be lower than estimates developed using the CIAF in all countries.
- The CAF classification system indicated substantial variation across countries in children with multiple AFs, which does not resemble the overall prevalence of undernutrition.
- Like, 7.5% of children in Niger and 7.1% of children in Timor-Leste were stunted, underweight, and wasted, while 56.0% of children in Niger and 71.1% of children in Timor-Leste were undernourished according to the CIAF.
- Additionally, children suffering from stunting, underweight, and wasting showed 1.52 times the odds of diarrhea compared to children who exhibited no AFs.

These results highlight the importance of using different approaches to aid understanding of the entire spectrum of AF concerning research and development of policies and programs to address AF. The use of the CIAF and the CAF classification system may be useful for treatment to prevent AFs and could aid in meeting targets for the Sustainable Development Goal.

(Source: JAMA Netw Open. 2022;5(3):e221223.)

The Newborn Delivery Room of Tomorrow: Emerging and Future Technologies

Advancements in neonatal care have shown improved outcomes in high-risk newborns with technologies playing a significant part although many were designed for the neonatal intensive care unit. The care provided in the delivery room (DR) during the first few minutes of life affects short- and long-term neonatal outcomes. Increasingly, technologies play a crucial role in the DR, especially with monitoring and information provision. However, the DR is a distinctive environment and has major provocations near the period of fetal to neonatal transition that need to be addressed when developing new technologies.

When introducing any new equipment into a time-critical, acutely stressful DR resuscitation scenario, the benefits must be apparent. Increasing monitoring modalities in the DR can cause information overload and impact performance. However, emerging technologies promise safety and the progress of outcomes following neonatal stabilization or resuscitation. Adding technologies to the DR will impact an individual infant's care, enhance the training of healthcare professionals (HCPs) and allow collaborative working across centres. Thus efforts need to be intensified to deliver new innovative technologies to improve newborn DR care during the first golden minutes of life, aspiring to minimize morbidities that can dwell with infants for their lifetime.

(Source: Pediatric Res. 2022. https://doi.org/10.1038/s41390-022-01988-y)

Neonatal Hemoglobin Levels in Preterm Infants are Associated with Early Neurological Functioning

Neonatal anemia may hinder oxygen transport to the brain. The effect of anemia and cerebral oxygenation on neurological functioning in the early neonatal period remains unclear.

A recent study determined the association between initial hemoglobin levels (Hb) and early neurological functioning in preterm infants by assessing their general movements (GMs).

Data on preterm infants born before 32 weeks of gestation was collected. Infants with intraventricular hemorrhage > Grade II were excluded from the study. On Day 8, infants' GMs were assessed; both generally as normal/abnormal and in detail using the general movement optimality score (GMOS). Cerebral tissue oxygen saturation (rcSO2) on Day 1 was measured using near-infrared spectroscopy.

The results were as follows:

- Sixty-five infants with a median gestational age of 29.9 weeks; a median birth weight of 1,180 g were included in the study.
- Median Hb on Day 1 was found to be 10.3 mmol/L.
- Lower Hb on Day 1 was found to be associated with a higher risk of abnormal GMs and poorer GMOSs.
- Hemoglobin was found to be strongly correlated with rcSO2.
- Infants with lower rcSO2 values were demonstrated to have a higher risk of abnormal GMs.
- After adjusting for confounders, Hb on Day 1 presented 44% of the variance of normal/abnormal GMs and rcSO2 presented 17%.
- Concerning the explained variance of the GMOS, this was 25% and 16%, respectively.

Thus in preterm infants, low Hb on Day 1 is associated with impaired neurological functioning on Day 8, which is probably due to low cerebral oxygenation.

(Source: Neonatology. 2021;118:593-99.)

Effectiveness of Feeding Supplementation in Preterm Infants: An Overview of Systematic Reviews

Preterm infants contain higher nutrition needs than term infants. Single specific systematic reviews (SRs) assessed the effectiveness of various feeding supplementation by describing the improvement in health outcomes. A recent review comprehensively described the effectiveness of feeding supplementation in promoting health outcomes of preterm infants.

A literature search was conducted to find the relevant SRs which followed strict inclusion and exclusion criteria.

The following results were obtained:

- Seventeen SRs were included in the final review.
- SRs documented 15 different varieties of feeding supplementation.
- In preterm infants, the effectiveness of feeding supplementation along with regular breastfeeding was largely shown in 6 factors: physical health, neurodevelopment, biochemical outcomes, other health outcomes, morbidity and all-cause mortality.
- Most systematic reviews found the effectiveness of the interventions on health outcomes in preterm infants.
- The methodological quality of all the SRs stood high, and the majority of the evidence was of low or very low quality.

These findings will facilitate a better understanding of feeding supplementation in preterm infants. Although the feeling supplements may improve the health outcomes in preterm infants, the existing evidence is unsure. Thus, these supplements should be cautiously used in clinics and more well-designed RCTs are warranted to further address the unsolved problems of the included SRs.

(Source: BMC Pediatric. 2022;22(1):20.)

Maternal Mentalization and Child Emotion Regulation: A Comparison of Different Phases of Early Childhood

Parental reflective functioning describes the parents' ability to reflect on the internal mental states of their children, which will make them react more sensitively to their children´s needs. The association between parental reflective functioning and child emotion regulation is regarded to be a key factor in early childhood parenting but further research is needed about this relationship throughout a child's development.

A recent study analyzed this interaction considering the early childhood development stages. Three hundred and eighty one mothers having babies between 0 and 26 months of age were enrolled on the study. The PRFQ and ASQ:SE-2 questionnaires were used to assess parental reflective functioning and child emotion regulation, respectively. Results revealed that maternal RF and child emotion regulation do not obey a linear process according to the childhood development stages. The maternal PM dimension was also seen to generate a conditional effect on children's emotion regulation.

Thus, caregivers' mentalizing capacity is crucial in maintaining and facilitating the development process of the child's emotional competence. Also, its absence might be associated with emotional problems that may cause behavioral difficulties. This is suitable during the first 2 years (from birth to 26 months), but specifically in the stages of the child's first year.

These results emphasize the importance of paying attention to specific early childhood developmental stages to understand the influence of maternal reflective functioning on a child´s ability to calm and adjust to her/his environment.

(Source: Infant Behav Dev. 2022;66:101681.)

Infant's Behaviour Checklist for Low Birth Weight Infants and Later Neurodevelopmental Outcome

Evaluating the features of spontaneous movements and behavior in early infancy assists in estimating developmental outcomes. A recent study introduced the Infant Behaviour Checklist (IBC) and examined the relationship between the behavioral characteristics of low-birth-weight infants and neurodevelopmental outcomes at 6 years of age. The behavioral characteristics during the neonatal (36-43 weeks, adjusted) and early infancy periods (49-60 weeks, adjusted) were evaluated in very-low-birth-weight infants. The IBC contains 44 common behaviors.

The study evaluated the arrival of individual behavioral characteristics at each period according to the neurodevelopmental outcome.

One hundred forty-three infants were assessed during the neonatal period, of which 89 showed typical development (TD), 30 showed intellectual disability (ID), and 24 showed autism spectrum disorder (ASD). Seventy-eight infants were assessed during early infancy, of which 40, 21, and 17 showed to have TD, ID, and ASD, respectively. The three behavior-related items had a significantly lower frequency of appearance in the ID group than in the TD group. The three posture- and behavior-related items had a significantly lower frequency of appearance, while of two posture-related items was a significantly higher frequency of appearance, in the ASD group than in the TD group. Behavioral assessment using the IBC may deliver promising clues when evaluating an early intervention for low-birth-weight infants.

(Source: Sci Rep. 2021;11(1):19286.)

Neonatal Stroke in Premature Neonates

Numerous neuro-imaging studies describe the presence of brain lesions in the preterm infant, using cranial ultrasound (cUS) and/or term equivalent age MRI (TEA-MRI). These studies however focus on germinal matrix hemorrhage-intraventricular hemorrhage (GMH-IVH) and white matter injury. Studies regarding perinatal arterial ischemic stroke (PAIS) or cerebral sinovenous thrombosis (CSVT) in the preterm infant are very limited. Several large cohort studies on neuroimaging in preterm infants do not mention neonatal stroke. The majority of the studies about PAIS exclude preterm infants. Thus a recent study provides an update on neonatal stroke in the preterm infant, with a focus on neuroimaging findings.

Perinatal Arterial Ischemic Stroke

These centrally located infarcts become apparent after the first postnatal week. They are typically wedge-shaped and mostly do not involve the posterior limb of the internal capsule (PLIC). 'Cortical sparing' can be seen in the preterm infant either partial or complete, with complete sparing seen only in infants with a GA < 32 weeks and partial sparing in infants with a GA of 33-37 weeks.

Periventricular Hemorrhagic Infarction

GMH-IVH can convert to periventricular hemorrhagic infarction (PVHI) due to impaired venous drainage of the medullary veins into the terminal vein. The area of echogenicity can be globular and continuous with the lateral ventricle and may spread over several lobes, even causing a midline shift. A sagittal plane view can describe the involvement of the trigone. Follow-up scans can reveal the globular lesion evolving into a single cyst communicating with the lateral ventricle (porencephaly) while a triangular-shaped lesion developing multiple cysts which are often not or partly communicating with the lateral ventricle and therefore misdiagnosed as c-PVL.

Neonatal Cerebral Sinovenous Thrombosis Neuroimaging

Neonatal CSVT frequently involves the superficial venous system and can also show thrombosis of multiple sinuses of both the superficial and deep venous system. Preterm infants often have extensive white matter injury that resembles that of periventricular leukomalacia, which may develop into extensive white matter cysts. This often presents beyond the immediate neonatal period and emerges in combination with late-onset IVH. Thus considering the diagnosis of CSVT in a preterm infant presenting with late-onset white matter injury and unexpected late-onset IVH is important.

Cranial Ultrasound

Using Color Doppler cUS can demonstrate partial or a total absence of flow in combination with partial or complete occlusion of the affected sinus(es). Also, cUS can show associated brain lesions in the form of (late-onset) IVH and white matter injury.

Magnetic Resonance Imaging

Since the symptoms of neonatal CSVT can be non-specific, MR venography (MRV) should also be included in all infants who undergo MRI because of seizures and/or an unusual presentation of (late-onset) IVH or white matter injury.

(Source: Semin Perinatol. 2021;45(7):151471.)