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What's New in Research?

A review and analysis of recent publications on
children affected by HIV and AIDS

July 2015 Edition

The *What's New in Research?* newsletter is available online at www.ovcsupport.net. Add the *What's New in Research?* blog to your social reader to receive instant updates.

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What's New in Research?



Web version available at OVCsupport.net

July 2015

PEPFAR partners with USAID's Leadership, Management, and Governance project to support the Human Sciences Research Council (HSRC), South Africa in the production of *What's New in Research?* - a quarterly newsletter that alerts readers to new scientific publications. The newsletter focuses on relevant, evidence-based and peer-reviewed research about children affected by HIV and AIDS. *What's New in Research?* is an initiative to make existing research more visible and accessible, and to encourage further research activities in the field of Orphans and Vulnerable Children.

In this newsletter, we review several papers that present new scientific findings on neurodevelopment and early adversity, especially in relation to HIV infection and HIV exposure.

The first article broadly examines the evidence to date on the impacts of HIV infection and antiretroviral medication on neurocognitive function, while the second explores the importance of age of treatment onset and persistence of neurocognitive benefits over a child's early years. The third is a landmark review of evidence indicating that, due to the damage to all aspects of development caused to children reared from a young age in institutions, there is a need to both de-institutionalize young children and prevent the establishment of new orphanages. Also included are two papers that look at nutrition and growth of HIV exposed and infected children. The first study describes impacts on growth and development of children born to women who were themselves perinatally infected, showing second-generation impacts on infant growth. The second, on differences in nutritional status between HIV-infected males and females, indicates that HIV-infected male children are more adversely affected by nutritional status than HIV-infected females. Lastly, we review a report on the potential of massage therapy to improve developmental outcomes of HIV exposed children.

Reviewed in this edition of *What's New in Research?*

- **Perinatally acquired HIV infection: Long-term neuropsychological consequences and challenges ahead.**
- **Early viral suppression improves neurocognitive outcomes in HIV-infected children.**
- **The science of early adversity: is there a role for large institutions in the care of vulnerable children?**
- **Growth patterns in the first year of life differ in infants born to perinatally vs. nonperinatally HIV-infected women.**

- Sex differences in nutritional status of HIV-exposed children in Rwanda: a longitudinal study.
- Massage therapy improves the development of HIV-exposed infants living in a low socio-economic, peri-urban community of South Africa.

Perinatally acquired HIV infection: Long-term neuropsychological consequences

Smith, R., & Wilkins, M. (2015). *Child Neuropsychology*, 21(2), 234-268. doi: 10.1080/09297049.2014.898744

Published Abstract

Over the past three decades, perinatal HIV infection in the United States has evolved from a fatal disease to a manageable chronic illness. As the majority of youth with perinatal HIV infection age into adolescence and adulthood, management of this stigmatizing, transmittable disease in the backdrop of a cadre of environmental stressors presents challenges beyond those of other chronic illnesses. The neurologic and neuropsychological consequences of this neurotropic virus have important implications for the successful navigation of responsibilities related to increasingly independent living of this aging population. This article will review the neurologic and neuropsychological consequences of perinatal HIV infection and concomitant factors in the era of highly active antiretroviral therapy and will provide an overview of the neuropathology, pathogenesis, neuroimaging findings, and treatment of perinatal HIV infection, as well as recommendations for service provision and future research.

Availability: Subscription or pay for access

Comment

This paper reviews the common neurological effects of perinatal HIV infection and exposure to antiretroviral (ARV) medications in both the USA (where HIV subtype B predominates) and in sub-Saharan Africa (where HIV subtype C predominates). The authors note that children infected with HIV in sub-Saharan Africa are also subject to multiple other infections, such as tuberculosis and malaria, as well as malnutrition, which can complicate the course of their development. In both settings, progressive encephalopathy (brain dysfunction) is an expression of HIV infection, usually associated with advanced HIV disease.

While ARV drugs are associated with improved neurodevelopment, milder forms of dysfunction remain. With treatment, 2% to 15% of children suffer from cognitive disabilities ranging from mild delays to global impairment. As per this study's findings, infected children who were initiated late on highly active antiretroviral therapy (HAART), and who survived into adolescence, tended to have more cognitive delays. Adolescents who begin treatment but do not adhere to their regimens may also manifest neurological symptoms. Adherence (up to 95%) is critical among youth who have been on ARV drugs for a long time; unfortunately, studies have found that only a small proportion of youth maintain this level of adherence.

It is suggested that one mechanism of HIV-associated brain dysfunction is chronic inflammation, which also plays a causal role in other chronic diseases that in turn affect HIV-positive youth as they age. Individual predisposing factors (such as genetics) and ARV drugs can help to protect against brain dysfunction, but as children age into adolescence, both HIV infection and HAART

also become risk factors for cerebrovascular disease. Cerebrovascular disease affects blood flow to and in the brain, especially among adolescents with high viral load.

In addition, the psychosocial environment in which children living with HIV grow up may be unsupportive and even disruptive of adaptive neuropsychological functioning, due to challenges such as social stigma, family instability, life stresses, and bereavement. Despite these many confounding factors and the challenge of controlling for them in studies of neurocognitive function, there is now a fairly substantial amount of literature on perinatally infected children and youth that supports several conclusions:

- 1) In terms of intelligence, perinatally infected children tend to perform at the lower end of the normal range, with substantial variation within the group.
- 2) Young people with early and severe disease progression tend to have poorer neurocognitive outcomes. One reason is that the brain is one of the reservoirs in the body in which the HIV virus independently replicates and evolves.
- 3) While there is a great deal of interest in executive functioning (see Box 1), studies assessing the full range of executive functioning are only now coming out, nonetheless indicating significant deficits in memory skills.
- 4) HIV-infected youth are at risk of hearing loss, with resulting effects of language impairment.
- 5) Motor deficits are much more likely to be reported in studies conducted pre-HAART compared with young people who were already on treatment.
- 6) Mental health problems are pervasive among perinatally infected youth and tend to be predictive of behavioral risks.
- 7) Either as a result, or independent, of these aforementioned deficits, HIV-infected youth tend to show deficits in achievement and in adaptive functioning, including independent living.

Implications for Policy and Practice

Large numbers of perinatally infected children are surviving into adolescence, but not without significant social, psychological, health and neurocognitive challenges. If South Africa, for example, were to reach a 4 percent vertical transmission rate for all pregnant women living with HIV, at least 12,000 children would continue to be infected every year. These children and their families will benefit from the following recommendations and services in order to minimize the effects of HIV on their lives:

- 1) Children must begin HAART as soon as possible and must remain adherent at a very high level throughout childhood and adolescence.
- 2) Preventive social services must be provided to families to reduce stresses that impact family well-being.
- 3) Children's development must be monitored and early deficits in sensory and cognitive function, such as hearing or memory, need to be addressed through medical services and/or rehabilitation.

- 4) Educational support must be made available to those children and youth who experience scholastic difficulties.

The fight against HIV is far from over and its residual effects on those affected are likely to be felt for decades. *“Adult literature suggests a growing concern that long-term exposures to HIV and its treatment may accelerate the ageing process via increased incidence of inflammatory processes and co-morbid disease, prevalence of high-risk behaviors, ARV toxicities, and chronic inflammation (Deeks, 2011)”* (p. 254).

Box 1 – Definition of Executive Function

The Center on the Developing Child at Harvard University defines executive function and self-regulation skills as “the mental processes that enable us to plan, focus attention, remember instructions, and juggle multiple tasks successfully. Just as an air traffic control system at a busy airport safely manages the arrivals and departures of many aircraft on multiple runways, the brain needs this skill set to filter distractions, prioritize tasks, set and achieve goals, and control impulses...” Executive function and self-regulation skills depend on three types of brain function: working memory, mental flexibility, and self-control. These functions are highly interrelated. Each type of skill draws on elements of the others, and the successful application of executive function skills requires them to operate in coordination with each other. **Working memory** governs our ability to retain and manipulate distinct pieces of information over short periods of time. **Mental flexibility** helps us to sustain or shift attention in response to different demands or to apply different rules in different settings. **Self-control** enables us to set priorities and resist impulsive actions or responses.

See http://developingchild.harvard.edu/key_concepts/executive_function/

Early viral suppression improves neurocognitive outcomes in HIV-infected children.

Crowell, C. S., Huo, Y., Tassiopoulos, K., Malee, K. M., Yogev, R., Hazra, R., . . . Study, t. P. H. C. (2015). *AIDS*, 29(3), 295-304. doi: 10.1097/qad.0000000000000528

Published Abstract

Objective: *To estimate the association of age of viral suppression and central nervous system penetration effectiveness (CPE) score with neurocognitive functioning among school-age children with perinatally acquired HIV infection (PHIV+).*

Design: *We analyzed data from two U.S.-based multisite prospective cohort studies.*

Methods: *Multivariable general linear regression models were used to evaluate associations of age at viral suppression and CPE scores (of initial antiretroviral therapy regimen and weighted average) with the Wechsler Intelligence Scale for Children, Third or Fourth Edition neurocognitive assessments [Full-Scale Intelligence Quotient (FSIQ); Performance IQ/Perceptual Reasoning Index (PIQ/PRI); and Verbal IQ/Verbal Comprehension Index (VIQ/VCI)], adjusted for demographic and clinical covariates. Sensitivity analyses were stratified by birth cohort (before versus after 1996).*

Results: *A total of 396 PHIV+ children were included. Estimated differences in mean FSIQ (comparing virally suppressed versus unsuppressed children) by each age cutoff were 3.7, 2.2, 3.2, 4.4, and 3.9 points at ages 1, 2, 3, 4, and 5, respectively. For PIQ/PRI, estimated mean differences were 3.7, 2.4, 2.2, 4.6, and 4.5 at ages 1 through 5, respectively. In both cases, these differences were significant only at the age 4 and 5 thresholds. After stratifying by birth cohort, the association between age at suppression and cognitive function persisted only among those born after 1996. Age at viral suppression was not associated with VIQ/VCI; CPE score was not associated with FSIQ, verbal comprehension, or perceptual reasoning indices.*

Conclusion: *Virologic suppression during infancy or early childhood is associated with improved neurocognitive outcomes in school-aged PHIV+ children. In contrast, CPE scores showed no association with neurocognitive outcomes.*

Availability: *Subscription or pay for access*

Comment

As indicated in the previous paper reviewed (by Smith and Wilkins, 2015), while combination ART is associated with a decrease in severe neurocognitive impairments, children on treatment may still experience a variety of deficits. Studies are now becoming more sophisticated and specific, including the investigation of HIV disease progression and its effects on neurocognitive outcomes. In the previous paper it was also pointed out that there is a reservoir of HIV virus in the brain. The central nervous system penetration effectiveness score (CPE) is a measure of the extent that ARV medications penetrate this area. The aim of this paper was to examine whether

the neurocognitive benefits seen in infancy with early introduction of ART continue into school-age. The children in the study were enrolled through two well-known US-based cohorts: the Pediatric HIV/AIDS Cohort Study (PHACS) network and the Pediatric AIDS Clinical Trials Group (PACTG) 219C cohort. These cohorts consisted of both infected children and exposed but uninfected children. The children were assessed using the gold standard for intelligence: the Wechsler Intelligence Scale for Children (WISC), either Version III or IV. Three disease (exposure) measures were examined: earliest age at viral suppression, CPE score at first ART initiation, and CPE score by age cut-off.

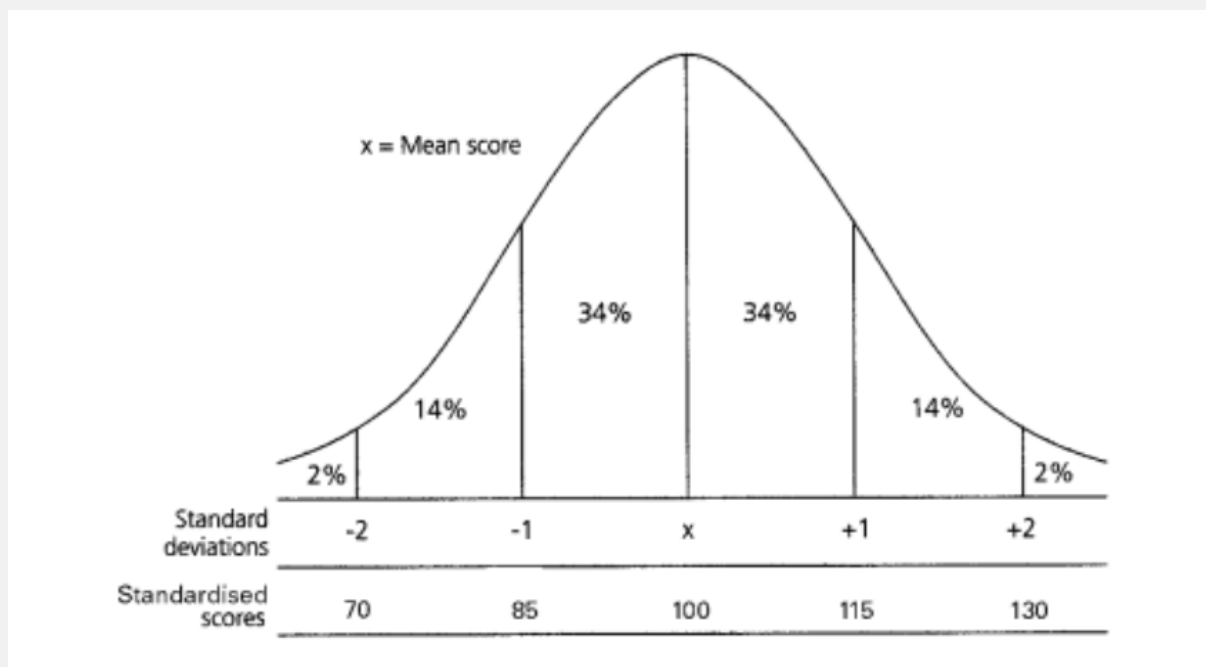
The findings from the study show that early viral suppression (that is, early effective treatment) is associated with improved intelligence scores. An earlier study showed that achieving viral suppression before three months of age resulted in improved neurodevelopmental outcomes when compared with viral suppression achieved at 11 months of age (Laughton et al, 2013). However, this study also showed that while viral suppression before age 5 indicated some benefit, the IQ benefits achieved were small (2 to 4 IQ points, or less than a third of a standard deviation) and were not likely to be clinically significant. The authors conclude that additional interventions are needed to prevent or lessen the neurocognitive deficits associated with perinatally acquired HIV.

Implications for Policy and Practice

The cognitive and other deficits suffered by children infected with HIV during pregnancy, birth and early infancy remain a major but neglected concern, contributing substantially to the personal and social burden of developmental delay and disability. The majority of affected children are born in areas of the world where there are, as yet, few preventive, diagnostic and rehabilitative services to assist children and families in meeting the challenges of growing up and living with HIV.

Box 2 – Intelligence Scores Explained

One method of obtaining an IQ score from an intelligence test, such as the Wechsler Intelligence Scale for Children (WISC), is with reference to a mean (a standard) and a standard deviation (variation from the mean or standard). An older method was to use the child's score on the test as a mental age and divide it by the child's chronological age. The scores from IQ tests are standardized in two ways: firstly, they are made comparable (like a percentage – 7/10 is 70% just as 14/20 is) and, secondly, they are put in a position in relation to a large number of children of the same age who also took the test. The scores of current IQ tests have a mean of 100 and a standard deviation of 15. Most children (about 68%) score in the “average range”, that is, between 85 and 115. About 14% score below, and about 14% score above one standard deviation, that is, between 70 and 85 or between 115 and 130 (“below average” and “above average”). Only about 2% of children score below 70 or above 130. This is demonstrated in the curve below.



The science of early adversity: is there a role for large institutions in the care of vulnerable children?

Berens, A. E., & Nelson, C. A. (2015). *The Lancet*. doi: 10.1016/S0140-6736(14)61131-4

Published Abstract

It has been more than 80 years since researchers in child psychiatry first documented developmental delays among children separated from family environments and placed in orphanages or other institutions. Informed by such findings, global conventions, including the 1989 UN Convention on the Rights of the Child, assert a child's right to care within a family-like environment that offers individualised support. Nevertheless, an estimated 8 million children are presently growing up in congregate care institutions. Common reasons for institutionalisation include orphaning, abandonment due to poverty, abuse in families of origin, disability, and mental illness. Although the practice remains widespread, a robust body of scientific work suggests that institutionalisation in early childhood can incur developmental damage across diverse domains. Specific deficits have been documented in areas including physical growth, cognitive function, neurodevelopment, and social-psychological health. Effects seem most pronounced when children have least access to individualised caregiving, and when deprivation coincides with early developmental sensitive periods. Offering hope, early interventions that place institutionalised children into families have afforded substantial recovery. The strength of scientific evidence imparts urgency to efforts to achieve deinstitutionalisation in global child protection sectors, and to intervene early for individual children experiencing deprivation.

Availability: http://faithtoaction.org/wp-content/uploads/2013/09/14TL0649_Berens.pdf

Comment

This is a landmark paper in the debate about whether institutional care for young children should be continued or whether every effort should be made by international and local governments and advocates to close down group institutions and find suitable family-based care for all children. The paper summarizes the existing literature on the negative impacts of group institutions on the physiological, neurological, and psychosocial development of children. The authors begin with a quotation from the Convention on the Rights of the Child: “the child, for the full and harmonious development of his or her personality, should grow up in a family environment, in an atmosphere of happiness, love and understanding”. What follows is a review of the evidence of the deleterious effects of institutionalization on all aspects of children’s development.

1. Physical Growth: One of the most consistent findings is suppressed growth, as manifested in shorter stature, lower weight and smaller head circumference. Apart from disease and nutritional factors, this growth suppression is thought to result from the effects of stress on growth mechanisms caused by institutional environments. One review quoted in the paper estimated that infants and toddlers lost one month of linear growth (height) for every 2 to 3 months spent in an institution.

2. Cognitive Function: A meta-review of 42 studies from 19 countries involving 3,888 children showed that children in institutions had IQs below average. IQ decrements were significantly associated with younger age at institutionalization. Moreover, interventions to place children in family care have shown significant IQ gains, provided the placements took place before 3 years of age.
3. Brain Structure and Function: Both size of brain structures and connectivity between them are shown to be affected in institutionalized children. The authors describe studies which assessed volumetric differences in the amygdala, which supports emotional learning and creativity. Two studies noted an increase in amygdala volume among institutionalized children, and found an association between increased amygdala volume and older age at deinstitutionalisation.
4. Socio-emotional Development: Institutionalized children show disturbed attachment patterns that are associated with later psychopathology. Specifically, children in institutions show inappropriate approach and affection towards strangers. As the authors' review shows, *timing matters*. The younger the age at which children are institutionalized and the longer they stay, the more they are damaged by the experience.

Implications for Policy and Practice

Despite the strong evidence of the adverse consequences, the institutionalization of young children continues. For example, in China, the construction of large institutions has been one response to care for children whose parents have died from AIDS. However, technical experts from WHO and the European Council emphasize that "... deinstitutionalization is not simply a matter of removing children from group homes, but a policy-driven process aimed at the transformation of child protection services to focus on family-level and community-level support." (p. 8).

Box 3 – Infants in Institutions: A Historical Perspective

The authors begin their paper by quoting from a paper by Henry Dwight Chapin published in 1915 in the Journal of the American Medical Association entitled "Are institutions for infants really necessary". The abstract of the paper, anticipating the rigorous scientific evidence amassed over the last 100 years, states:

In considering the best conditions for the relief of acutely sick infants and for foundlings or abandoned babies, two important factors must always be kept in mind: (1) the unusual susceptibility of the infant to its immediate environment, and (2) its great need of individual care. The best conditions for the infant thus require a home and a mother. The further we get away from these vital necessities of beginning life, the greater will be our failure to get adequate results in trying to help the needy infant. Strange to say, these important conditions have often been overlooked, or, at least, not sufficiently emphasized, by those who are working in this field.

Growth patterns in the first year of life differ in infants born to perinatally vs. nonperinatally HIV-infected women.

Jao, J., Agwu, A., Mhango, G., Kim, A., Park, K., Posada, R., . . . Sperling, R. S. (2015). *AIDS*, 29(1), 111-116. doi: 10.1097/qad.0000000000000501

Published Abstract

Objective: *To compare the growth patterns in the first year of life between children born to perinatally HIV-infected (PHIV) vs. nonperinatally HIV-infected (NPHIV) women in the United States. Design: Retrospective cohort study of HIV-infected pregnant women who received care and delivered a live-born at two urban tertiary centers from January 2004 to March 2012.*

Methods: *We collected data via chart review on demographics, behavioral risk factors, HIV clinical markers, combination antiretroviral therapy (cART), mode of HIV acquisition, pregnancy outcomes, and infant anthropometrics on study participants. Mixed-effects models were used to assess the association between maternal mode of HIV acquisition and weight-for-age z-score (WAZ), length-for-age z-score (LAZ), and weight-for-length z-score (WLZ).*

Results: *Of the 152 pregnancies evaluated, 32 and 120 infants were born to 25 PHIV and 99 NPHIV women, respectively. Infants of PHIV women exhibited lower mean WAZ and LAZ throughout the first year of life in unadjusted analyses. After adjusting for potential confounders, the relationship between PHIV women and LAZ persisted ($\beta = -0.54$, $P = 0.026$). Small-for-gestational age for each birth anthropometric parameter (birth length, birth weight, and both birth length and weight) was associated with decreased LAZ ($\beta = -0.48$, $P = 0.007$), WAZ ($\beta = -0.99$, $P < 0.001$), and WLZ ($\beta = -0.36$, $P = 0.027$), respectively. A delivery HIV RNA level below 400 copies/ml was associated with increased WAZ and WLZ ($\beta = 0.43$, $P = 0.015$ and $\beta = 0.38$, $P = 0.021$, respectively).*

Conclusions: *Infants of PHIV women may remain at persistently decreased lengths throughout the first year of life. Further studies aimed at understanding intrauterine and environmental factors in PHIV women are warranted.*

Availability: Subscription or pay for access

Comment

As a result of effective treatment, more people living with HIV are surviving into their reproductive years, including women who were themselves perinatally infected with HIV. In this study of second-generation effects, the authors compare the growth of exposed but uninfected infants born to women who were perinatally infected with the growth of infants born to women who were HIV infected at some later time in their lives, controlling for the potential confounding factors, such as maternal age, pre-pregnancy body mass index (BMI) and substance use during pregnancy. The women who were perinatally infected tended to have more severe disease indicators than those who were infected later, as indexed by CD4 count

and viral suppression. The children of perinatally infected mothers had lower length-for-age at one year after adjusting for maternal and disease factors. Children with poor growth in infancy showed, on average, lower educational achievement and lower earnings as adults when compared with children showing normal linear growth. These findings draw attention to the second-generation effects of perinatal HIV infection of women, and the importance of providing long-term support for families affected by HIV.

Implications for Policy and Practice

As these long-term survivors are achieving pregnancies, maternal immunological alterations association with chronic HIV infection and inflammation, as well as maternal behavioral, neurocognitive and metabolic complications from long-term HIV and antiretroviral (ARV) exposure present a growing concern for potential impact on the developing foetus/infant” (p. 2).

Box 4: The Consequences of Poor Infant Linear Growth

Key parameters of infant growth include weight-for-age (WFA), height/length-for-age (HFA), weight-for-length (WFL) and head circumference. Underweight, or wasting, is caused by acute under-nutrition, either as a result of insufficient food or persistent infection which uses metabolic energy. Short stature, or stunting, results from long-term under-nutrition and reflects a child’s nutritional and/or disease history, often beginning during pregnancy and manifest in a child being small-for-gestational age (SGA). Although infant growth charts used in most well-baby clinics track weight, few track length or height even though it is a critical indicator of long-term outcomes. Prospective studies outside of the context of HIV show that poor early postnatal growth is associated with short adult stature, lower scores on cognitive tests, fewer years of schooling and lower educational attainment, less likelihood of employment and lower wages.

For a review of the consequences of poor linear growth in infancy, see Victora et al. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet*, 371, 340-57. doi: 10.1016/S0140-6736(07)61692-4. PubMed PMID: 18206223 PMID: PMC2258311.

Sex differences in nutritional status of HIV-exposed children in Rwanda: a longitudinal study.

Condo, J. U., Gage, A., Mock, N., Rice, J., & Greiner, T. (2015). *Tropical Medicine & International Health*, 20(1), 17-23. doi: 10.1111/tmi.12406

Published Abstract:

Objective: *To examine sex differences in nutritional status in relation to feeding practices over time in a cohort of HIV-exposed children participating in a complementary feeding programme in Rwanda.*

Methods: *We applied a longitudinal design with three measurements 2–3 months apart among infants participating in a complementary feeding programme who were 6–12 months old at baseline. Using early feeding practices and a composite infant and child feeding index (ICFI) as indicators of dietary patterns, we conducted a multivariate analysis using a cross-sectional time series to assess sex differences in nutritional status and to determine whether there was a link to discrepancies in dietary patterns.*

Results: *Among 222 boys and 258 girls, the mean (\pm SD) Z-score of stunting, wasting and underweight was $-2.01 (\pm 1.59)$, $-0.15 (\pm 1.46)$, $-1.19 (\pm 1.29)$ for boys; for girls they were $-1.46 (\pm 1.56)$, $0.22 (\pm 1.29)$, $-0.63 (\pm 1.19)$; all sex differences in all three indicators were statistically significant ($P < 0.001$). However, there were only minor differences in early feeding practices and none in the ICFI by sex.*

Conclusions: *HIV-exposed male children may be at higher risk of malnutrition in low-resource setting countries than their female counterparts. However, at least in a setting where complementary foods are being provided, explanations may lie outside the sphere of dietary patterns.*

Availability: <http://onlinelibrary.wiley.com/doi/10.1111/tmi.12406/epdf>

Comment and Implications for Policy and Practice

Under-nutrition, which is a significant cause of infant mortality and of childhood and later disability, can be prevented and ameliorated with relatively simple, cost-effective interventions. This paper investigates sex differences in nutritional status, which are usually attributed to biological susceptibility to disease and/or cultural differences in care and feeding. The researchers found that girls had consistently better nutritional status, and that boys were significantly more likely than girls to be malnourished across all ages. There was some difference in feeding practices of boys and girls, with girls being more likely to be breastfed at 6 months; however, the difference was not statistically significant.

These findings, of sex differences in nutritional status with boys at a disadvantage, are consistent with other findings in Africa. Apart from methodological bias, there are two possible explanations for the results. The first, that boys are more biologically vulnerable than girls, is

bolstered by findings that mortality rates are slightly higher for boys than girls. The second explanation could lie in care practices that discriminate between boys and girls. For example, girls might receive more attention, better health care, and feeding, compared with boys. Alternatively, boys might be encouraged to engage in behaviors that expose them to more infections than girls. A lesson from the study is that the widely publicized male-preference in Asia does not apply in Africa and greater attention must be paid to the care and nutrition of boy children in this region.

Massage therapy improves the development of HIV-exposed infants living in a low socio-economic, peri-urban community of South Africa.

Perez, E. M., Carrara, H., Bourne, L., Berg, A., Swanevelder, S., & Hendricks, M. K. (2015). *Infant Behavior and Development*, 38(0), 135-146. doi: <http://dx.doi.org/10.1016/j.infbeh.2014.12.011>

Published Abstract

The aim of this study was to assess the effect of massage therapy on the growth and development of infants of HIV-infected mothers in a low socio-economic community in Cape Town. It was a prospective, randomised, controlled intervention trial that included massage therapy and control groups of HIV-infected mothers and their normal birth weight infants who were enrolled in the prevention of mother-to-child transmission (PMTCT) programme. Participants were recruited at the 6-week clinic visit and followed up every 2 weeks until their infants were 9 months of age. Mother–infant pairs in the massage therapy and control groups included 73 and 88 at 6 weeks and 55 and 58 at 9 months, respectively. Mothers in the intervention group were trained to massage their infants for 15 min daily. The socioeconomic status, immunity, relationship with the partner and mental pain of mothers; the infants' dietary intake, anthropometry and development (Griffiths Mental Development Scales); and haematological and iron status of mothers and infants were assessed at baseline and follow-up. Nine infants (5.3%) were HIV-infected on the HIV DNA PCR test at 6 weeks. Despite significantly higher levels of maternal mental pain, infants in the massage therapy compared to control group scored higher in all five of the Griffiths Scales of Mental Development and significantly higher in the mean quotient ($p = 0.002$) and mean percentile ($p = 0.004$) for the hearing and speech scale at 9 months. Based on the mean difference in scores, the massage therapy group showed greater improvement for all five scales compared to the control group. The mean difference in scores was significantly greater for the hearing and speech quotient (21.9 vs. 11.2) ($p < 0.03$) and the general quotient percentile (19.3 vs. 7.7) ($p = 0.03$) in the massage therapy compared to the control group. These scales remained significant when adjusting for the relationship with the partner and maternal mental pain. Both groups had lower scores in the performance scale at 9 months although this was significantly worse in the control compared to the massage therapy group when adjusting for maternal CD4 count, anemia, relationship with the partner and mental pain. There were no significant differences in the anthropometric measurements between the two groups. In conclusion, based on the Griffiths Scales, massage therapy improved the overall development and had a significant effect on the hearing and speech and general quotient of HIV-exposed infants in this study.

Availability: Subscription or pay for access

Comment

Infant massage has been shown to have various physical and psychological benefits for infants. Psychologically, it enhances interaction between the primary caregiver and the baby through eye contact, physical touch, vocalization and shared emotional states. These factors are all

likely to calm the baby and increase attentiveness. In addition, the physical stimulation of massage leads to higher vagal nerve activity, which promotes soothing and regulation of autonomic functions, such as heart rate and breathing, which are also associated with increased attention. Attention is one of the executive functions that enable learning and the execution of skills.

Box 5 – Infant Massage Techniques

Infant massage is a widely practiced tradition around the world and is now encouraged by medical providers given its demonstrated benefits on infant immune function, length of hospital stay for low birth weight babies, and promotion of infant growth. The Mayo Clinic in the USA, an eminent source of information on health care, gives these massage instructions to parents:

Start by creating a calm atmosphere. If possible, do the massage in a warm, quiet place — indoors or outdoors. Remove any jewelry you're wearing. Sit comfortably on the floor or a bed or stand in front of the changing table and position your baby on a blanket or towel in front of you. Place your baby on his or her back so that you can maintain eye contact and bring your baby's body close to you. As you undress your baby, tell him or her it's massage time.

When you first start massaging your baby, use a soft and gentle touch. Avoid tickling your baby, however, which might irritate him or her. As your baby grows, use a firmer touch.

While specific techniques vary, infant massage usually involves slowly stroking or kneading each part of your baby's body. You might start by placing your baby on his or her stomach and spending about one minute each gently rubbing different areas, including your baby's head, neck, shoulders, upper back, waist, thighs, feet and hands. Next, place your baby on his or her back and spend about one minute each extending and flexing each of your baby's arms and legs, and then both legs at the same time. Finally, with your baby either on his or her back or stomach, repeat the rubbing motions for another five minutes.

As you massage your baby, stay relaxed. Talk to your baby throughout the massage. You might sing or tell a story. Try repeating your baby's name and the word "relax" as you help him or her release tension. Watch how your baby responds to the massage. If your baby jiggles his or her arms and seems happy, he or she is likely enjoying the massage and you can continue. If your baby turns his or her head away from you or appears restless or unhappy, stop the massage and try again later.

<http://www.mayoclinic.org/healthy-living/infant-and-toddler-health/in-depth/infant-massage/art-20047151>