Title: Anthropometric Measures and Cognitive and Motor Development in Children with Congenital Zika Syndrome (CZS)

Authors: Danielle Toth¹, Anne Wheeler¹, Camila Ventura², Liana Ventura², Pollyanna Bezerra², Lucélia Lima Nobrega², Raine Costa Borba Firmino², Claudia Marques da Silva², Don Bailey¹

Introduction: The Zika virus (ZIKV) outbreak in Brazil from 2015-2016 resulted in a sharp increase in the number of newborns born with microcephaly and congenital defects. In particular, the Northeast of Brazil observed the majority of cases nationally, experiencing a microcephaly prevalence rate 28 times higher than in the previous 4 years.¹ Infants diagnosed with Congenital Zika Syndrome (CZS) who presented with microcephaly and other clinical characteristics continue to face severe developmental delays, including motor impairments, and ocular and central nervous system abnormalities. Early reports document length and weight measurements well below the mean for their age and sex among children with CZS.² However, due to the fact that this is the first cohort of children diagnosed with CZS as a result of in utero exposure to the ZIKV, there is a paucity of data documenting their growth trajectories beyond the first 2 years of life. This study will examine the growth and development of children with CZS and the relationship between height, weight, current cephalic perimeter and motor and cognitive impairment.

Methods: As part of a 5-year longitudinal study, 160 children (mean age = 40.8 months) with CZS in Recife, Brazil were evaluated for weight, height, and cephalic perimeter by nurses at the Altino Ventura Foundation (FAV) where they receive clinical services. They were administered the Bayley Scales of Infant and Toddler Development 3 (BSID-III) which measures child development across 5 domains (cognitive, receptive communication, expressive communication, fine motor, and gross motor) by trained research assistants immediately following measurements. They were also administered the Gross Motor Function Measure (GMFM) which is an assessment tool designed to measure changes in gross motor function over time. Weight, height, and head circumference standards were based on the World Health Organization’s (WHO) international Child Growth Standards.³

Results: The average BMI for the sample of children with CZS is 15.1 (SD = 3.8; 10.8-39.8) which is considered underweight. Approximately 37% of children are considered underweight for their age; 7.5% and 17% are overweight and obese, respectively. There were no significant differences in BMI between males and females About 94% of the sample have head circumferences >= 3 SDs below the mean for their age and sex. Results of a linear regression analysis indicated that head circumference is statistically associated with cognitive scores as measured by the BSID-III (R² =0.0913, F(1,155) = 15.57, p<0.001). A Wilcoxon signed rank test showed a statistically significant difference in gross motor scores (Z = 2.91, p=0.0042) in normal/healthy weight children as compared to children who are either underweight, overweight, or obese. However, this was not true for fine motor scores. Follow-up data using the GMFM are currently being collected, and the change in gross motor function over time will be reported and compared to BMI and head circumference measurements.

Discussion: This study evaluated the growth and development of children with CZS at 3-4 years of age through anthropometric measures, illuminating that inadequate weight gain and head circumference growth are sustained through early childhood from early infancy for children with CZS. Further research into the atypical growth trajectories of children with CZS should be explored as over half (61.3%) of the sample fall into either an underweight, overweight, or obese BMI category.

References:


¹ RTI International
² Altino Ventura Foundation