Telomere Length and Racial Disparities in Preterm Infants

Sharon G. Casavant, PhD; Bo Reese, PhD; Hongfei Li; Yiming Zhang, Adam Matson, MD/PhD; Shabnam Lainwala, MD; Ming-Hui Chen, PhD; Xiaomei Cong, PhD,

Introduction

Prior to 1986, it was widely believed that preterm infants did. not feel pain and thus did not receive anesthesia during surgery. In 1986 Anand et al. conducted a randomized control trial with anesthesia. Those who received anesthesia had significantly lower morbidity and mortality rates. Long term effects of repeated painful procedures is just now being studied. Preterm infants admitted to the Neonatal Intensive Care Unit (NICU) face numerous painful/stressful procedures daily that are simply part of routine life-saving care. Early exposure to stress and adverse environmental experiences are linked to altered development and behavioral problems later in childhood. Thus, we hypothesized that preterm infants exposed to greater numbers of painful/stressful procedures would have greater telomere erosion.

Sample

Thirty-six infants, 50% female recruited at 2 NICUS, given a subject ID number to ensure confidentiality. Inclusion criteria: 28-36 weeks' gestational age (GA) experienced repeated painful/stressful procedures in The NICU. Exclusion criteria: major brain lesions, periventricular leukomalacia, neuro sensorial deficits, genetic syndromes and/or major malformations.

Methods

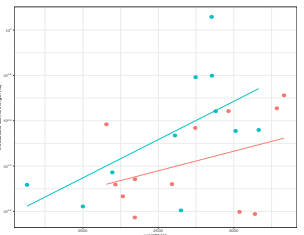
- Clinical data collected from electronic medical records including acute and chronic painful/stressful procedures.
- DNA was collected via buccal swabs at two time points (NICU discharge and 18-24 months corrected age in the NICU Follow-up Clinic
- Absolute telomere length was ascertained using qPCR technology at NICU discharge time point.
- Bayley Scales of Infant Development assessed at 18-24 months corrected age.

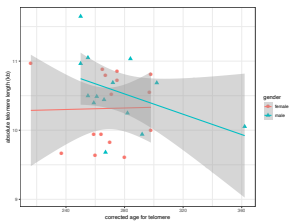
Data Analysis

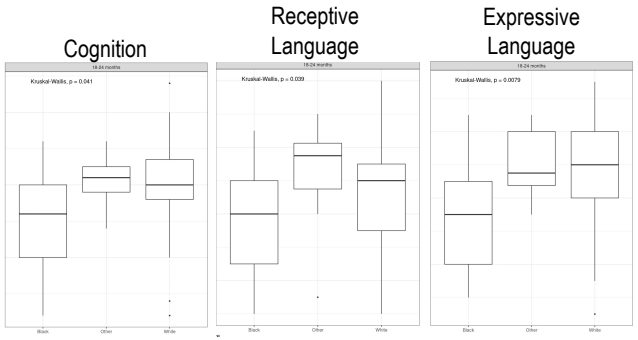
--Absolute telomere lengths compared between different categorical variables by Mann-Whitney U test.
--Spearman correlation was calculated to associate the absolute telomere length with other continuous variables.
--Multiple linear regression model used to fit absolute telomere lengths to all predictors
--Absolute telomere length was log-transformed before fitting the model to satisfy the normality assumption and the missing predictors were imputed by multiple imputation (MI) algorithm.

Results

The data collected included:
--Infant demographics and other clinical information.
--Absolute telomere length (aTL) at time of buccal collection shows a trend of aTL associated with corrected GA across gender, with males having telomeres that eroded more quickly over time than females.
--Among our 36 samples, 33 samples had reliable aTL measures.
--All reactions were run in triplicate on the same plate and negative control reactions were also used for each primer set.
--The mean aTL was 38,628 kb pair per diploid genome (range 14,895 114,388 kb).
--Statistically significant positive correlation between weight at buccal swab and telomere length
--Pandemic limited ability to collect samples.
--Secondary analysis of race and neurodevelopmental outcomes indicated that Black/African American preterm infants were born at significantly lower GA, birthweight, length and head circumference (all p<0.001).
--Additionally, Black/African American preterm infants experienced significantly higher chronic pain (p=0.002).
--They also scored significantly lower in terms of cognition (Kruskal-Wallis, p=0.041), receptive and expressive language Kruskal-Wallis, p=0.008 and p=0.039 respectively.







Conclusion

Our hypothesis that preterm infant telomere lengths are longer was confirmed, however, our hypothesis that preterm infants who experienced more painful/stressful procedures would have shorter telomeres than those who had less was not confirmed given the small sample size and the pandemic. A trend of telomere length by sex was noted. Secondary analysis indicated that race was linked with worse anthropometric measures and negative neurodevelopmental sequelae.

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Significance

Further research is needed regarding preterm infant telomere length and factors that may slow or speed the erosion process. Additionally, data related to Black/African American mother's perceived racism, neighborhood vulnerability, stress and telomere length need to be collected and compared with their preterm infant to determine if the differences in Black/African American infant development is associated with racial disparities.
The responses to these questions are the core of your contribution and justify why readers outside of your own specialty should be interested in your findings.

References

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