Child Health Research Institute

University of Nebraska Medical Center

Children's NEBRASKA

The Relationship Between Neonatal Anthropometric Measurements and Body Composition in Term Infants

Megan Ott, Anum Akbar, Matthew VanOrmer, Rebekah Rapoza, Rebecca Slotkowski, Allison Zetterman, Kayla Adams, Anita Zhou, Andrea Rodriguez Dasta, Teri Mauch, Corri Hanson, Ann Anderson-Berry, Melissa Thoene

Background: Infant body composition is an important tool to track growth and evaluate potential risk for malnutrition, obesity, or metabolic disorders. Air displacement plethysmography is the gold-standard for measuring body composition but is often cost-prohibitive. Mid-upper arm circumference (MUAC), lower chest circumference (LCC), and mid-thigh circumference (MTC) have been proposed as feasible and cost-effective measurements of infant growth, but little is known about how these anthropometric measurements correlate with infant body composition.

Significance: Identifying accurate and cost-effective measures of infant body composition could improve infant health through early identification and/or treatment of altered growth, especially in resource-limited areas.

Hypothesis: We hypothesize neonatal percent body fat will be positively correlated with feasible anthropometric measurements, including MUAC, LCC, and MTC.

Methods: An IRB-approved study enrolled 34 term (gestational age ≥37 weeks, 0 days) infants at the time of delivery. Birth weight, length, and head circumference percentiles were collected from infant medical records and weight-for-length percentiles were assessed using the 2006 WHO growth standards. MUAC (n=24), LCC (n=24), and MTC (n=20) were measured within the first week of life. Fat mass, fat-free mass, and percent body fat were measured by air displacement plethysmography (PEA POD). Spearman correlations were used to evaluate the relationship between anthropometric measurements and body composition. P-value <0.05 was considered statistically significant.

Results: Median birth gestational age was 39.3 weeks (IQR 38.3-40.1) and 47.1% of infants were male. Percent body fat was positively correlated with birth weight percentile (rs=0.36, p=0.04) and weight-for-length percentile (rs=0.38, p=0.03). There was no correlation between percent body fat and birth length (p=0.52) or head circumference (p=0.20) percentile. Similarly, there was no correlation between percent body fat and MUAC (p=0.40), LCC (p=0.14), or MTC (p=0.08). However, fat mass and fat-free mass were both positively correlated with MUAC, LCC, and MTC.

Conclusion: Neonatal percent body fat was not correlated with MUAC, LCC, or MTC, suggesting that these anthropometric measurements are not comparable surrogate measures of infant body composition. Additional research is needed in a larger cohort to identify other feasible and cost-effective measures of infant body composition.