

0130 - PEDIATRIC OBESITY ONSET DRIVES MORE SEVERE MOLECULAR AGING THAN ADULT-ONSET ADIPOSITY: A BIRTH COHORT STUDY ON BIOLOGICAL EMBEDDING

Mode: Research paper

Thematic Unit: Obesity

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Background/Objectives: Pediatric obesity induces cumulative metabolic stress, but whether specific developmental windows for adiposity onset program cellular aging at the molecular level remains understudied in Hispanic populations. We aim to evaluate the independent impact of obesity onset timing, from childhood to adulthood, on multi-systemic epigenetic clock acceleration and telomere length attrition.

Methods: Longitudinal study using a multiple-events case-control design nested within a Chilean birth cohort (n=321, 50% females). Obesity onset timing was categorized into 4 groups using cubic splines: always healthy control (G1), adolescent-onset (G2), childhood-onset (G3), and adult-onset obesity (G4). At 29y, biological aging was quantified using the general Horvath Clock acceleration (eea_horvath), measured via regression residuals; the cardiovascular-specific GrimAge Clock acceleration (eea_grimage); and DNA methylation-estimated telomere length (DNAmTL). Data were analyzed using ANCOVA models adjusted for sex, followed by Tukey-Kramer post-hoc tests.

Results: ANCOVA models show that obesity timing is a powerful predictor of molecular aging, explaining 37.1% of Horvath variance, 29.5% of GrimAge variance, and 30.6% of telomere attrition (P

Conclusion: Early life, particularly childhood and adolescence, is a crucial developmental period during which excess adiposity can induce permanent molecular aging. The significant cellular damage caused by pediatric obesity speeds up tissue deterioration across multiple systems and leads to faster telomere shortening, highlighting the critical need for prompt and vigorous weight-management strategies early in life. Funding: FONDECYT1210283-ACT210006-NIH-HL088530.

