

**Title:** Menstrual Profiles and Cardiovascular Markers Among a Cohort of Female Adolescent Athletes

**Authors:** Kaylee P Blevins, BA,<sup>1</sup> Madison Brna, BS,<sup>2</sup> Lauryn P Roth, MD,<sup>3</sup> David Howell, PhD,<sup>4,5</sup> Wendy M Kohrt, PhD,<sup>6</sup> Aubrey M Armento, MD<sup>4,5</sup>

<sup>1</sup>University of Colorado School of Medicine, Aurora, CO USA

<sup>2</sup>University of North Carolina School of Medicine, Chapel Hill, NC, USA

<sup>3</sup>Department of Obstetrics and Gynecology, University of Colorado School of Medicine, Aurora, CO, USA

<sup>4</sup>Sports Medicine Center, Children's Hospital Colorado, Aurora, CO, USA

<sup>5</sup>Department of Orthopedics, University of Colorado School of Medicine, Aurora, CO, USA

<sup>6</sup>Department of Medicine, University of Colorado School of Medicine, Aurora, CO, USA

**Abstract:**

Amenorrhea in female athletes may be associated with cardiovascular disease risk factors. We aimed to implement a rigorous methodology to confirm menstrual status and examine differences in lipid and inflammatory markers between amenorrheic and eumenorrheic athletes. We included 13-18-year-old participants who were over 1-year post-menarchal and not using hormonal medications. Participants reporting  $\geq 9$  menstrual periods in the prior year underwent a prospective methodology to be classified as eumenorrheic. Those reporting no menstrual period for more than 3

consecutive months prior to enrollment were classified as amenorrheic. We compared lipid and inflammatory markers between eumenorrheic and amenorrheic groups. There were 32 participants included (n=12 eumenorrheic; n=10 amenorrheic), with 96.5% adherence to the menstrual tracking protocol. The amenorrheic group demonstrated higher high-density lipoprotein levels (60.8 vs 52.7; p=0.04) and trended toward lower C-reactive protein levels (0.43 vs 1.53; p=0.07) than the eumenorrheic group.

Amenorrheic athletes did not demonstrate dyslipidemia or a pro-inflammatory state compared to eumenorrheic athletes, contrary to what has been observed in prior studies of adult athletes. We demonstrated feasibility and success in implementing a rigorous methodology to classify and confirm menstrual status in an adolescent athlete population that can be replicated in future studies.