

Iron Status and Metabolic Health in Women of Reproductive Age in Southern India

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Objectives: To examine the associations of iron status with metabolic health outcomes in women of reproductive age (WRA), as part of a population-based biomarker survey in Southern India.

Methods: Participants were WRA (15–40 y; n = 980) who were not pregnant or lactating (2017–2018). Blood samples were analyzed for hemoglobin (Hb; Coulter Counter) and glycated hemoglobin (HbA1c; nephelometry). Serum ferritin (SF) was measured by electrochemiluminescence; soluble transferrin receptor, C-reactive protein, and alpha-1 acid glycoprotein were analyzed *via* immuno-based assays (Roche). Anthropometric and blood pressure measurements were collected in triplicate. Bioelectrical impedance analysis (BC-418 MA) was used to estimate whole body (WF%) and trunk (TF%) fat in women \geq 18y. Anemia was defined as Hb < 12.0 g/dL. SF was adjusted for inflammation using Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) methods; iron

deficiency (ID) was defined as SF < 15.0 μ g/L. Linear and binomial regression were used to examine associations of iron status with metabolic outcomes.

Results: A total of 41.5% of WRA had anemia, and 46.3% had ID (61.5%; BRINDA-adjusted). A total of 23.3% of adults were overweight (BMI: 25.0–<30.0 kg/m²) and 9.6% had obesity (BMI \geq 30.0 kg/m²). Waist circumference (WC; \geq 88.9 cm) and waist-hip ratio (WHR; \geq 0.85) were elevated in 13.4% and 20.8% of women, and 25.0% had elevated HbA1c (\geq 6.5%: 5.0%; \geq 5.7–<6.5%: 20.0%). Higher Hb concentrations were associated with increased BMI (β : 0.42 [SE: 0.09]; $p < 0.01$), WC (0.77 [0.21]; $p < 0.01$), and WF% (0.89 [0.17]; $p < 0.01$). Higher SF levels were associated with higher WF% (β : 0.79 [SE: 0.32]; $p = 0.01$) and TF% (0.92 [0.39]; $p = 0.02$), and elevated WC (RR: 1.20 [95% CI: 1.02–1.42]). Iron status was not significantly associated with HbA1c or blood pressure.

Conclusions: The burden of adverse metabolic outcomes was substantial in this population. Higher iron status was associated with higher BMI and central adiposity. Evaluating iron status and metabolic outcomes in future studies could help inform screening and interventions to improve the health of WRA.

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