

The Effect of the Menstrual Cycle on Hemoglobin Mass

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ABSTRACT

The impact of the menstrual cycle on oxygen-carrying capacity remains equivocal. Previous studies reported either reductions or no significant changes in hemoglobin concentration during the follicular phase when compared to the luteal phase of the menstrual cycle. Changes in plasma volume associated with fluctuating estrogen and progesterone levels likely contribute to the variations in hemoglobin concentration observed throughout the menstrual cycle. Thus, measures of hemoglobin concentration do not accurately represent the oxygen-carrying capacity of the blood. Hemoglobin mass represents a more direct measure of oxygen-carrying capacity. However, the impact of menstrual blood loss on hemoglobin mass remains unknown. **PURPOSE:** To determine the effect of the menstrual cycle on hemoglobin mass in pre-menopausal women. **METHODS:** Twenty-one women (age: 23 ± 6 years, height: 167 ± 7 cm, weight: 66 ± 13 kg) with a regular menstrual cycle using ($n = 9$) and not using hormonal contraceptives participated in the study. Hemoglobin mass was assessed using the carbon monoxide rebreathing technique on three separate visits. Visits for women using hormonal contraceptives were scheduled in the early follicular phase (3-5 days post-onset of menses), late follicular phase (14 days post-onset of menses), and late luteal phase (10 days after the late follicular visit). Visits for women not using hormonal contraceptives were scheduled in the early follicular phase (3-5 days post-onset of menses), late follicular phase (1-2 days post-surge of luteinizing hormone in urine), and late luteal phase (10 days after the late follicular visit). **RESULTS:** No differences were observed in hemoglobin concentration across phases of the menstrual cycle (early follicular: 12.9 ± 1.3 g/dl, late follicular: 12.7 ± 0.9 g/dl, late luteal: 12.8 ± 0.9 g/dl, $p = 0.08$). Likewise, hemoglobin mass did not significantly differ between menstrual cycle phases (early follicular: 606 ± 73 g, late follicular: 601 ± 73 g, late luteal: 606 ± 68 g, $p = 0.90$). **CONCLUSION:** The menstrual blood loss has no significant impact on hemoglobin mass or oxygen-carrying capacity in women with a regular menstrual cycle.