

Comparison of haemoglobin concentration measured using three different techniques in pregnant people undergoing vaginal birth

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Background and Aims

- Obstetric haemorrhage is a leading cause of maternal mortality
- Point of care haemoglobin (Hb) concentration measurement devices may have an important role in guiding blood transfusion during resuscitation in obstetric haemorrhage
- We compared venous and capillary Hemocue® Hb, and Masimo Rad-67™ Pulse CO-Oximeter Hb with laboratory Hb in people having planned vaginal births

Methods

- Ethics approval, and prospective trial registration (ACTRN 12619000247178p) confirmed
- Venous and capillary Hemocue® Hb, and Masimo® Rad-67™ Pulse CO-Oximeter Hb were compared with laboratory Hb using Bland Altman analysis in term parturient
- Mean difference (bias) was acceptable if 0-5 g/dL, marginal if 6-10 g/dL, unacceptable if >10 g/dL
- Limits of agreement were acceptable if ≤ 45 g/dL, marginal if 46 – 50 g/dL, unacceptable > 50 g/dL
- Minimum sample size of 169 women at 80% power and 0.05 two-sided level of significance with an expected mean difference of 10 g/dL, standard deviation (SD) of differences at 15 g/dL, and a predefined clinical agreement limit for the maximum allowed difference between the two methods of 45 g/dL. A sample size of 180 was chosen to allow for 5% missing data

Results

- 180 healthy term pregnant people were recruited (mean (SD) age 32 (4.3) years, body mass index 28.0 (6.24) kg/m²)
- Five (2.8%) people had anaemia (Hb <110 g/dL)
- Figures 1 to 3 show histograms of laboratory Hb (true Hb) with superimposed Venous Hemocue® Hb, Capillary Hemocue® Hb and Masimo® Hb
- Venous Hemocue® Hb and laboratory Hb comparison had acceptable bias (SD) - 0.7 (7.54) g/dL 95% confidence interval (CI) to -1.79 to 0.43 g/dL and acceptable agreement 29.6 g/dL with limits of agreement (LOA) -15.46 to 14.10 g/dL
- Capillary Hemocue® Hb and laboratory Hb comparison had unacceptable bias (SD) - 13.3 (14.12) g/L 95% CI -15.34 to -11.17 g/dL and unacceptable agreement of 55.3 g/dL with LOA – 40.93 to 14.42 g/dL
- Masimo® Hb and laboratory Hb comparison had unacceptable bias (SD) 14.0 (11.15) g/dL, 95% CI 12.34 – 15.63 g/dL and marginal agreement of 43.7 g/dL of LOA -7.86 to 35.85 g/dL

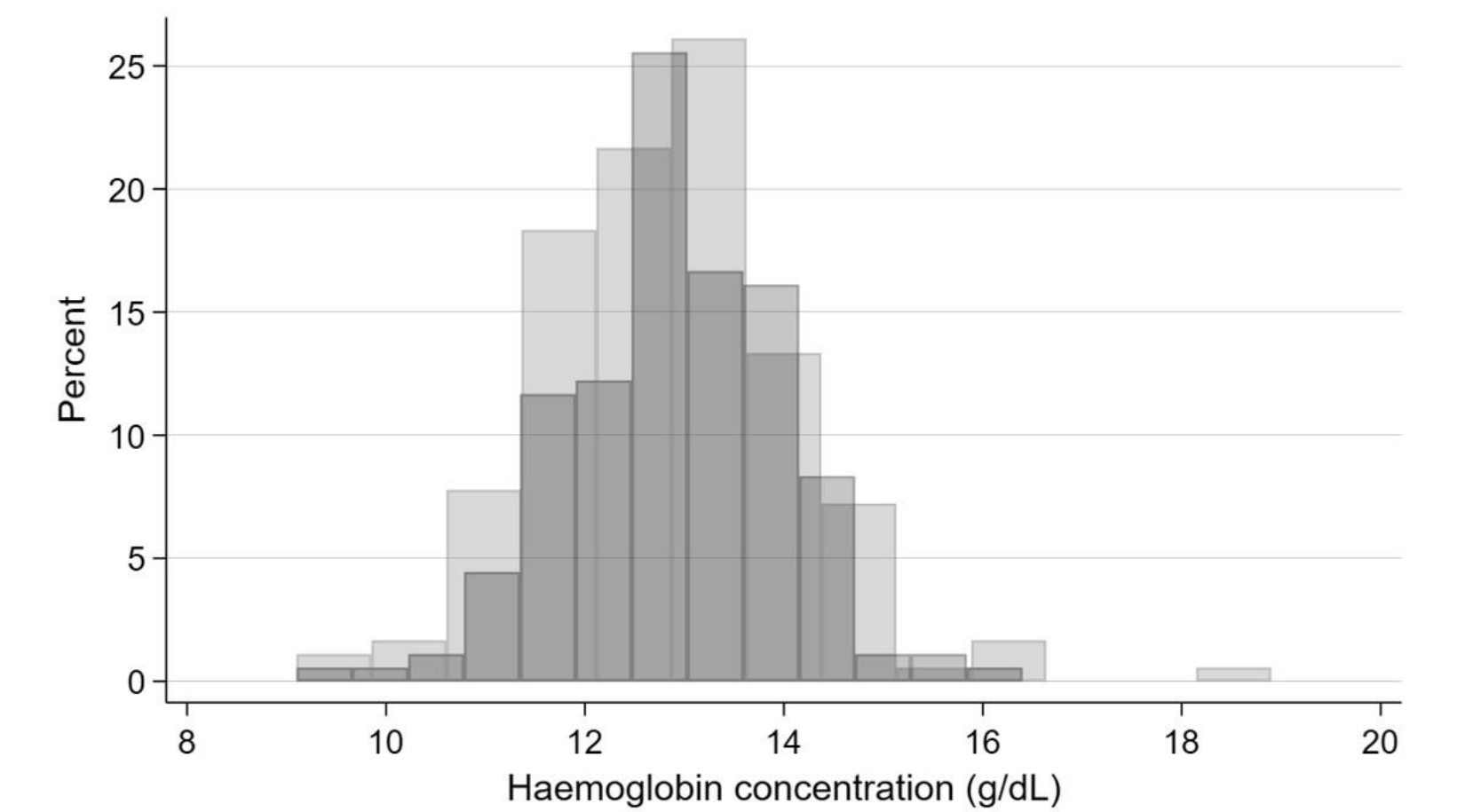


Figure 1 Laboratory Hb & Venous Hemocue® Hb

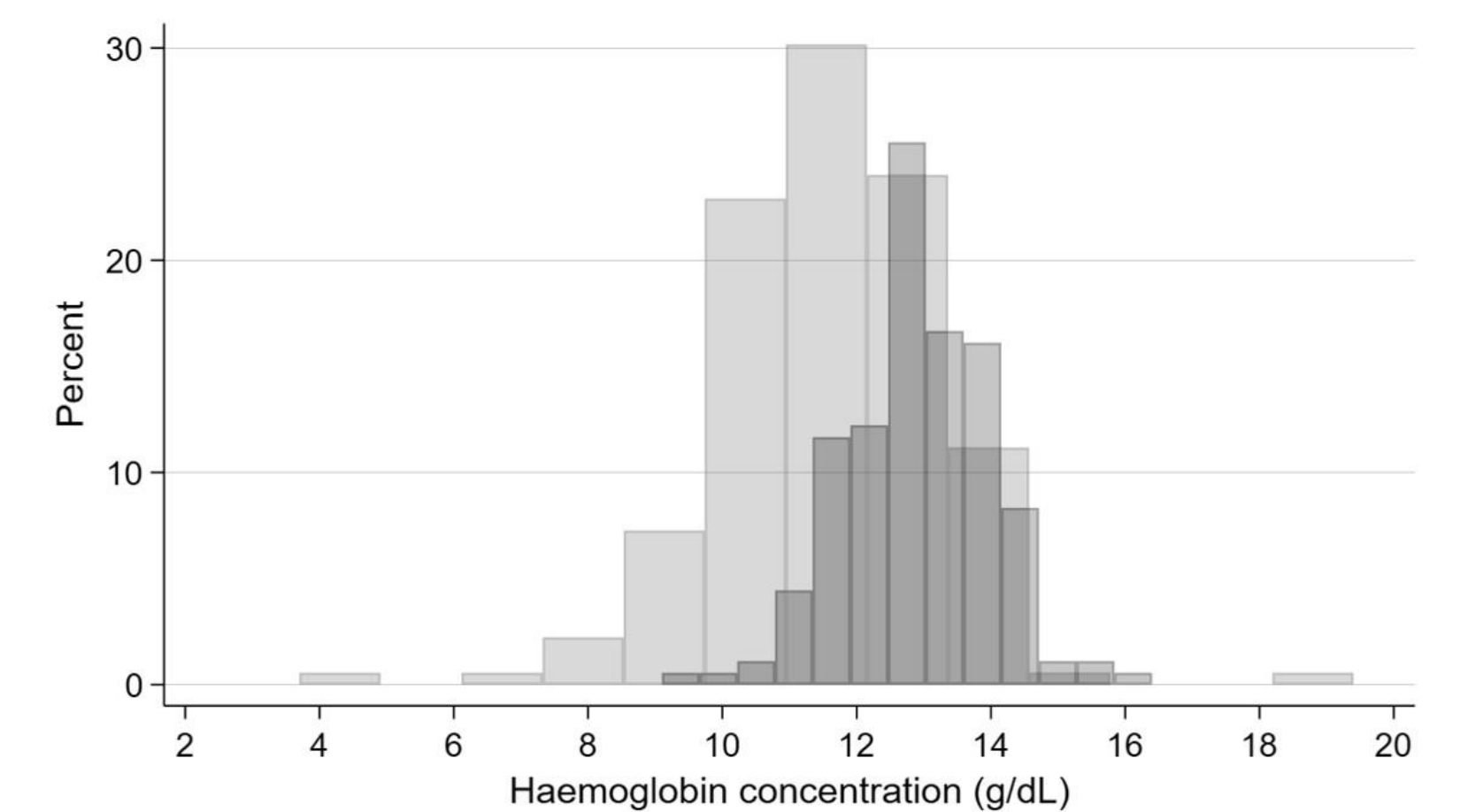


Figure 2 Laboratory Hb & Capillary Hemocue® Hb

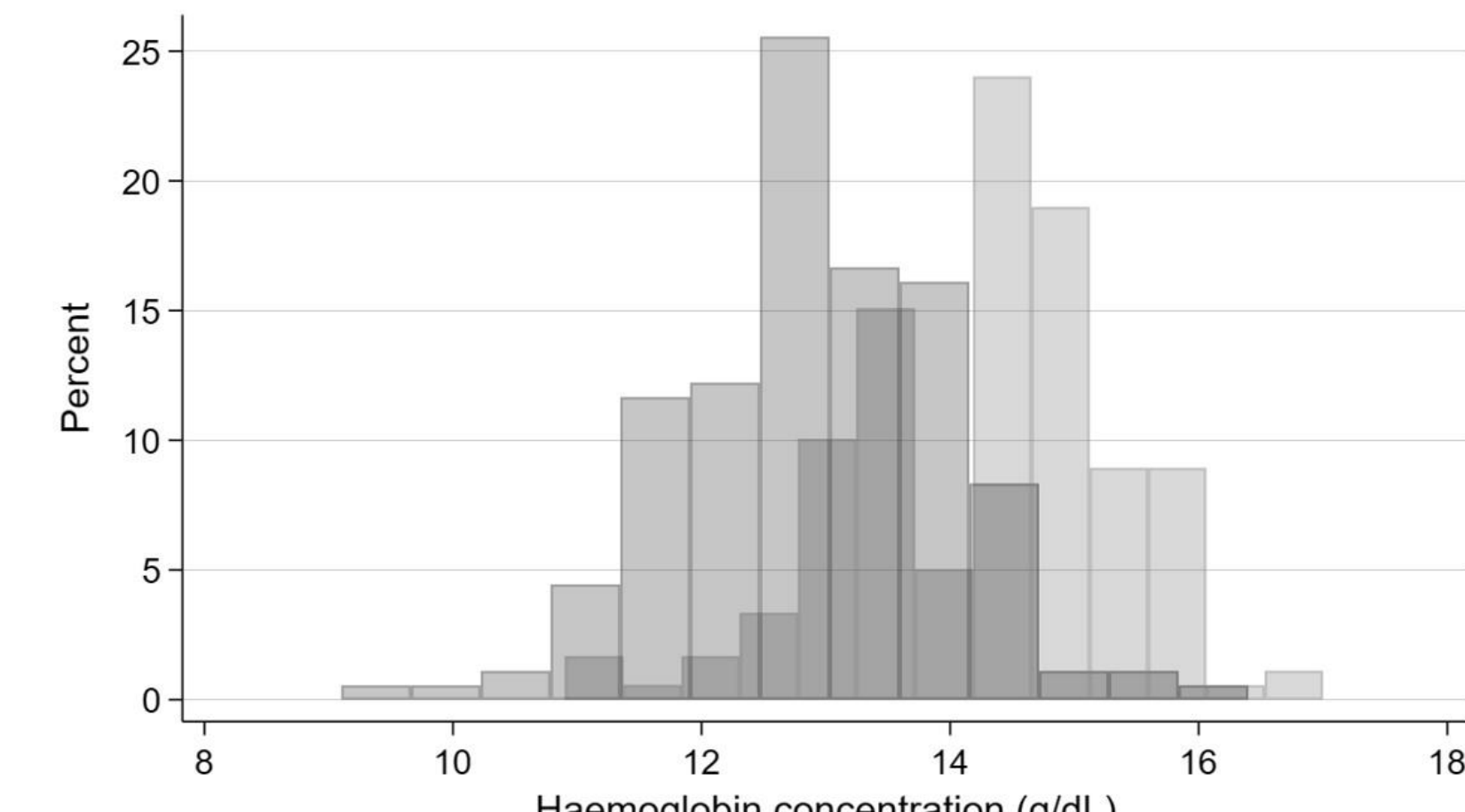


Figure 3 Laboratory Hb & Masimo® Hb

Key Messages

- Venous Hemocue® Hb measurement was comparable with laboratory Hb measurement
- Capillary Hemocue® Hb measurement under-estimated Hb thereby overestimating anaemia prevalence
- Masimo® Hb measurement over-estimated Hb thereby underestimating anaemia prevalence

Conclusion and Future Work

- Capillary Hemocue® and Masimo® Hb measurements demonstrated unacceptable bias and poor agreement with laboratory Hb limiting their clinical use
- Serial studies are needed to determine if the accuracy of Venous Hemocue® Hb measurements remain in the setting of haemorrhage