

Agreement between Noninvasive Hemoglobin and Laboratory Hemoglobin Measurements in Neonates: A Systematic Review and Meta-Analysis

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Background and objective: The noninvasive hemoglobin (NHb) devices are recently evaluated as an alternative to laboratory hemoglobin (LHb) in neonates. This systematic review explores the diagnostic accuracy of NHb devices for neonatal hemoglobin measurement.

Methods: Literature related to the comparison of NHb device with LHb in neonates was searched from Medline, PubMed Central, PubMed, Web of Science, Google Scholar, and Scopus databases after PROSPERO registration. The quality of included publications was assessed by QUADAS-2 (Quality Assessment of Diagnostic Accuracy Studies). The pooled correlation coefficient and bias (precision) in Bland-Altman difference plots were used for summary statistics using MetaXL 5.0 software.

Results: A total of 1,477 paired NHb-LHb observations were analyzed from 1,047 neonates in 10 studies. Massimo radical-pulse co-oximetry (8 studies) and Mediscan-2000 (2 studies) were used for NHb estimation. The pooled correlation coefficient between NHb and LHb was $r = 0.94$ (95% CI: 0.83-0.98, $p < 0.001$), and the pooled bias (precision) was -0.013 (1.4) gm/dL between NHb and LHb measurements in Bland-Altman analysis. NHb device had better precision in stable neonates (0.91gm/dL) over sick neonates (1.66 gm/dL).

Conclusions: Hemoglobin measurement by NHb is excellently correlated with LHb measurement with a minimal average difference. It may be used as a screening tool for hemoglobin measurement in neonates to avoid frequent phlebotomy.