

The WHO Haemoglobin Colour Scale can improve the accuracy of the diagnosis of anaemia in primary health care settings in low-income countries: a systematic review and meta-analysis

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Abstract

Background

Anaemia is a major cause of morbidity and mortality in low-income countries. Primary health care workers in resource-poor settings usually diagnose anaemia clinically, but this is inaccurate. The WHO Haemoglobin Colour Scale (HCS) is a simple, cheap quantitative method to assess haemoglobin level outside the laboratory. We systematically reviewed the literature to assess accuracy of the HCS in primary care to diagnose anaemia, and compared this with clinical signs.

Methods

We searched the electronic databases including MEDLINE, EMBASE, SCOPUS, Web of Science, Cochrane library, CINAHL plus, Popline, Reproductive Health Library, Google Scholar and regional databases up to November 2014. Two reviewers independently screened studies, extracted data and assessed quality using the QUADAS-2 tool. Statistical analyses were carried out in STATA using the bivariate model.

Findings

We included 14 studies from Africa and Asia, most carried out in children and pregnant women. The pooled sensitivity of the HCS to diagnose anaemia was 80% (95% CI 68%-89%), significantly higher than sensitivity for clinical signs (52%, 95% CI 36%-67%; $p=0.008$). Specificity was similar for the HCS (80%, 95% CI 59%-91%) and clinical signs (75%, 95% CI 56%-88%, $p=0.8395$).

For severe anaemia, diagnostic accuracy was again higher overall for the HCS ($p<0.0001$); sensitivity was similar: 57% (95% CI 36%-76%) for HCS and 43% (95% CI 9%-85%) for clinical signs, but specificity appeared higher: 99.6% (95% CI 95%-100%) versus 93% (95% CI 56%-99%). Combining clinical signs and the HCS would result in higher sensitivity (anaemia: 92%, 95% CI 83% -97%; severe anaemia: 90%, 95% CI 33%-100%), but at the expense of specificity (anaemia: 60%, 95% CI 33%-82%; severe anaemia: 84%, 95% CI 40%-98%). Individual studies were highly heterogeneous but pooled results did not differ markedly in a series of sensitivity analyses for indicators of study robustness.

Interpretation

Under "real life" primary health care conditions the HCS can significantly reduce misdiagnosis of anaemia compared to clinical assessment alone. Future research is required to optimise training, and evaluate clinical outcomes and cost-effectiveness.

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