



The multifactorial burden of anaemia in Africa

The causation of anaemia is multifactorial in developing countries and includes micronutrient deficiencies (e.g. iron, folate, vitamin B₁₂), chronic worm infections (e.g. hookworm, trichuris, schistosomiasis), haemoglobinopathies, cancer and chronic non-communicable disease such as chronic kidney disease and heart failure.

Anaemia is a major cause of morbidity in malaria, HIV and tuberculosis and is an independent prognostic marker in HIV. It also contributes to the progression of HIV and tuberculosis.¹

In Africa, anaemia is particularly common in individuals infected with soil-transmitted helminths or schistosomes. Blood loss in hookworm infections such as *Necator americanus* and *Ankylostoma duodenale* is strongly and linearly correlated with worm load and faecal egg count.² Polyparasitism (infection with several parasites) is common in poor communities and leads to a 5 - 8-fold increase in anaemia. Anaemia has therefore been suggested as a useful indicator of neglected disease burden and control² as it is a marker of morbidity rather than an indicator of infection by particular parasites. Iron deficiency often co-occurs with neglected infectious tropical diseases, and treatment of worm infection in combination with iron supplementation may lead to faster improvement of haemoglobin levels. The recently introduced Haemoglobin Colour Scale (HCS) can be used by non-laboratory health workers who have only a few hours' training and avoids the need for and transportation of venous samples.²

In this issue of the *SAMJ* two very interesting studies from Uganda^{3,4} highlight the multifactorial burden of anaemia in Africa.

Mukaya *et al.*³ report on a carefully conducted, cross-sectional descriptive study of 395 hospital patients, of whom 255 (64%) had anaemia. This was most commonly microcytic hypochromic (34%), with a mixture of nutrient deficiency and infections such as tuberculosis (22.7%) being the most common clinical diagnosis. Splenomegaly, HIV infection and a low body mass index were independently associated with anaemia in this study.

Infections such as HIV and tuberculosis are usually associated with a normocytic, normochromic anaemia of chronic disorder. However, chronic inflammation can coexist with iron deficiency, leading to microcytic features, as were possibly seen in the study by Mukaya *et al.* Data on iron status, patients' medications and level of immunosuppression could not be collected and therefore did not allow for a better understanding of the relationship between anaemia, HIV and tuberculous infection.

The authors found a low prevalence of hookworm infection of 9.1%, demonstrated by ova in the stool, which the authors

explained by successful de-worming programmes done in line with Uganda's National Anaemia Policy.

Kuule *et al.*⁴ report on 157 patients with heart failure attending a large referral hospital in Uganda, Mulago Hospital. Interestingly, this is the same hospital where the study by Mukaya and colleagues showed that 64.3% of the 225 patients had anaemia at admission. This is much higher than the level of anaemia we reported in heart failure patients from South Africa.^{5,6} However, the patients in Uganda presented with an even more advanced stage of the disease and most had chronic heart failure. Most patients (88%) had a normocytic, normochromic anaemia, fitting the criteria for anaemia of a chronic disorder. Unfortunately the authors did not report on underlying HIV or tuberculosis, making comparison with the study done by Mukaya difficult. However, with a 64% prevalence of anaemia reported in Mukaya *et al.*'s study³ on a population from the same hospital it is likely that some of the chronic heart failure patients had alternative or concomitant causes leading to the development of anaemia.

Anaemia in heart failure is a complex problem, as highlighted in detail in the study by Kuule *et al.*⁴ However, the pathophysiology is poorly understood. It typically involves numerous features such as iron and vitamin deficiency, haemodilution, insidious blood loss, bone marrow depression, angiotensin system blockade and resistance to erythropoietin. Chronic kidney disease is very common in patients with heart failure, and for these patients the prognosis is often poor.⁷ It has been suggested that decreased cardiac output, increased inflammation, oxidative stress and activation of the neurohormonal system may challenge kidney function in patients with chronic heart failure.

However, patients with hypertensive heart disease leading to heart failure may have underlying hypertensive kidney disease. Calculation of the estimated glomerular filtration rate (GFR) using the Modification of Diet in Renal Disease (MDRD) abbreviated formula and including an adjustment for black race is important.⁸ Approximately 27% of a cohort of 281 newly diagnosed South African patients from Soweto with hypertensive heart failure had evidence of renal dysfunction defined by an estimated GFR of <60 ml/min/173 m².⁷

Assessment of anaemia in chronic heart failure patients might have implications other than being an additional marker of advanced disease. Klapholz and colleagues reported recently on the safety and tolerability of darbopoetin-alpha as a form of treatment in patients with anaemia and symptomatic heart failure, showing that erythropoietin was well tolerated.⁹ Outcome studies using darbopoetin in chronic heart failure are under way.



In conclusion, given the high prevalence of anaemia in some regions in Africa, more studies to evaluate the causes of anaemia in the area of HIV and the increase in chronic diseases such as hypertensive heart disease are needed.

Karen Sliwa

Director: Soweto Cardiovascular Research Unit
University of the Witwatersrand
Johannesburg

Corresponding author: K Sliwa (sliwa-hahnlek@mdh-africa.org)

References

1. Moyle G. Anaemia in persons with HIV infection: Prognostic marker and contributor to morbidity. *AIDS Rev* 2002; 4: 13-20.
2. Bates I, McKew S, Sarkinfada F. Anaemia: A useful indicator of neglected disease and burden and control. *PLoS Med* 2009; 4(8): e231. doi:10.1371/journal.med.0040231.
3. Mukaya JE, Ddungu H, Ssali F, O'Shea T, Crowther MA. Prevalence and morphological types of anaemia and hookworm infestation in the medical emergency ward, Mulago Hospital, Uganda. *S Afr Med J* 2009; 99: 881-886.
4. Kuule JK, Seremba E, Freers J. Anaemia among patients with congestive cardiac failure in Uganda – its impact on treatment outcome. *S Afr Med J* 2009; 99: 876-880.
5. Sliwa K, Wilkinson D, Hansen C, et al. A broad spectrum of heart disease and risk factors in a black urban population in South Africa: results from The Heart of Soweto study clinical registry. *Lancet* 2008; 371: 915-922.
6. Stewart S, Wilkinson D, Hansen C, et al. A predominance of heart failure in The Heart of Soweto cohort: emerging challenges for an African cohort. *Circulation* 2008; 118: 2360-2374.
7. McMurray JJ. Chronic kidney disease in patients with cardiac disease: a review of evidence based treatment. *Kidney Int* 2005; 68: 1419-1426.
8. Inglis S, Stewart S, Papachan A, et al. Anaemia and renal function in heart failure due to idiopathic dilated cardiomyopathy. *Eur J Heart Fail* 2007; 9: 384-390.
9. Klapfholz M, Abraham WT, Ghali JK, et al. The safety and tolerability of darbopoetin alfa in patients with anaemia and symptomatic heart failure. *Eur J Heart Fail* 2009; 8 Oct (Epub ahead of print).