CHRONIC KIDNEY DISEASE ANAEMIA 1: DIAGNOSIS AND SCREENING

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This is a two-part unit on managing anaemia in chronic kidney disease. Part 1 outlines the prevalence, causes and signs and symptoms of the condition, which, until recently, was under-recognised and under-treated.

The profile of chronic kidney disease (CKD) has been raised following the publication of the Renal National Service Framework (parts 1 and 2) (Department of Health, 2005; 2004). In addition, since the introduction of routine estimated glomerular filtration rate (eGFR) reporting, the anaemia of CKD is being highlighted earlier in the disease process. Accurate diagnosis, however, depends on systematic screening processes.

PREVALENCE

The World Health Organization (2001) defined anaemia as haemoglobin (Hb) level <12g/dl in women who are not pregnant and <13g/dl in men (Table 1). Lower levels of kidney function are found to be associated with lower Hb levels, along with a higher prevalence and severity of anaemia (Astor et al, 2002). CKD is staged depending on the level of eGFR calculated (National Kidney Foundation – Kidney Disease Outcomes Quality Initiative, 2006). The numerical value obtained for eGFR (for example 30ml/min/1.73m²) can be approximated to a percentage of kidney function (that is, 30% kidney function).

Table 2 shows the stages of CKD and prevalence of anaemia (Coresh et al, 2003). Anaemia often develops early in CKD and some studies suggest that the majority of patients are anaemic the first time they see a nephrologist (Valderrabano, 2002). Cause

CAUSES

To obtain a clear diagnosis of anaemia in CKD, other causes of anaemia should be excluded as not all anaemia in patients with CKD will be ‘renal anaemia’. Common causes of anaemia aside from CKD can include the following:

- Chronic blood loss;
- Hypothyroidism;
- Chronic infection or inflammation;
- Hyperparathyroidism;
- Aluminium toxicity;
- Bone-marrow infiltration;
- Pure red-cell aplasia;
- Malignancy.

The most common causes of anaemia in CKD are:

- Reduced erythropoietin (EPO) production – anaemia in CKD is usually normochromic and normocytic. EPO deficiency is the primary cause of anaemia associated with CKD. EPO is predominantly produced by peri-tubular cells in the kidney and is the hormone responsible for promoting the proliferation and differentiation of erythroid progenitor cells in the bone marrow.

- Haemolysis – red blood-cell survival in healthy people is roughly 120 days but this can be reduced by as much as 25–50% in patients with CKD. The reason for impaired red blood-cell survival is not well understood but the presence of uremic toxins is thought to play an important role.

- Iron deficiency – iron is an essential component of red blood cells and about 65% of iron stored in the body is used to form haemoglobin. Iron deficiency should be assessed in patients with stage 3 and 4 CKD and is diagnosed when the serum ferritin level is <100mcg/l (NICE, 2006).

- Vitamin B12 and folate deficiency – both are essential for the production and maintenance of healthy new red blood cells. Deficiencies can occur due to underlying disease (for example pernicious anaemia) or dietary insufficiencies.

SIGNs AND SYMPTOMs

The onset of anaemia in CKD is often insidious. Common signs and symptoms experienced by patients with anaemia in CKD include the following:

- Pallor;
- Shortness of breath, notably on exertion;
- Reduced exercise capacity (Odden et al, 2004);
- Irritability;
- Depression;
- Reduced cognitive function (Valderrabano et al, 2001);
- Altered sleep patterns;

LEARNING OBJECTIVES

1. Understand the causes, signs and symptoms of anaemia in chronic kidney disease.

2. Know how to diagnose anaemia in chronic kidney disease.
Patients should be screened for anaemia in CKD if cKD is detected early via eGFr reporting, consequently, appropriate interventions. NICE guidance (2006) recommended that anaemia in CKD be screened for when the haemoglobin level falls below 11g/dl and that investigation into renal causes of anaemia should be triggered when the eGFr falls below 60ml/min/1.73m² (approximately 60% kidney function). When haemoglobin levels are <12g/dl (men) or <11g/dl (women), the systematic screening of patients should include a comprehensive evaluation of the following tests:

- Full blood count and reticulocyte count;
- Iron status, which will include serum ferritin, percentage of transferrin saturation and possible percentage of hypochromic red cells;
- Serum B12 and folate levels;
- Haemolysis screen (haptoglobin, lactate dehydrogenase, direct antithrombin test);
- C-reactive protein (CRP) – as a marker for infection/inflammation;
- Past medical history;
- Assessment of occult gastrointestinal blood loss;
- Nutritional status of patient.

**NURSES’ ROLE IN SCREENING**

Nurses play a vital role in the screening and detection of anaemia in CKD, as they often have the most consistent relationship with patients with progressive kidney disease, regardless of the particular care setting. The continuity of care and ongoing professional relationship that nurses often have with patients with long-term conditions places them in a unique position to identify the onset of symptoms of anaemia of CKD, or to observe a change and/or worsening of existing symptoms.

The identification of symptoms of anaemia in CKD should trigger investigation, or referral for investigation of the screening tests recommended above. Preliminary screening for anaemia in CKD should always include a systematic evaluation of these tests and timely onward referral to appropriate clinicians if any abnormal results are obtained.

**CONCLUSION**

Anaemia of CKD is a common co-morbid factor that complicates the management of patients with CKD. The cause may be multifactorial but is primarily due to erythropoietin deficiency. Careful evaluation of patients, systematic screening and review is necessary to ensure treatment can be initiated in a timely and effective manner.

### TABLE 2. STAGES OF CKD AND PREVALENCE OF ANAEMIA

<table>
<thead>
<tr>
<th>STAGE OF CKD</th>
<th>eGFR (ml/min/1.73m²)</th>
<th>MEDIAN HB IN MEN (g/dl)</th>
<th>MEDIAN HB IN WOMEN (g/dl)</th>
<th>PREVALENCE OF ANAEMIA* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>60–90</td>
<td>14.9</td>
<td>13.5</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>30–59</td>
<td>13.8</td>
<td>12.2</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>15–29</td>
<td>12.0</td>
<td>10.3</td>
<td>33</td>
</tr>
</tbody>
</table>

* Anaemia defined in study as Hb<12g/dl in men, Hb<11g/dl in women (Coresh et al, 2003)

### KEY REFERENCES


- The full reference list for this unit is available in Portfolio Pages at nursingtimes.net