GUIDELINE

Anaemia in childhood

<table>
<thead>
<tr>
<th>Scope (Staff):</th>
<th>CACH, WACHS</th>
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<tr>
<td>Scope (Area):</td>
<td>Child Health</td>
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This document should be read in conjunction with this DISCLAIMER

Aim
The aim of this document is to provide community health staff guidance in the prevention, early detection, management and monitoring of children with Iron Deficiency Anaemia (IDA) in children.

Risk
The rapid growth of the brain in the early stages of life makes infants more susceptible to iron deficiency. Iron Deficiency Anaemia (IDA) is associated with faltering growth and stunting and neurodevelopmental delay. Suspected links between IDA and impaired performance in mental and motor development have been proposed. Infants with IDA have been shown to have poorer cognitive, motor and social/emotional functioning than healthy infants and associated with poorer outcomes in the long term for children with IDA.

Risk Factors

Maternal
- Medical conditions/complications during pregnancy and postnatal e.g., haemorrhagic disease /infection
- Untreated maternal anaemia during pregnancy
- Vegetarian and vegan diets: if insufficient iron-rich foods in the diet
- Twin or multiple pregnancy 1,2

Child
- Premature and low birth weight infants 3
- Delayed introduction of solids
- Gastrointestinal disease affecting iron absorption
- Faltering growth
- Chronic infections or parasitic infections 4,5,6
- Intake of cow’s milk before 12 months of age 7
- High intake of cow’s milk (which is a poor source of iron) milk in infants >12 months of age.
Environmental

- Residence in tropical environments\textsuperscript{4,5,6}
- Low socio-economic status.\textsuperscript{8,9,10}
- Food insecurity/access to iron rich foods.\textsuperscript{10,11}

Studies from the UK and US and other high income countries have shown that children of low socio economic status including low income families have a higher risk of IDA than children from average or high income families.\textsuperscript{8,9,10} The reasons for this are multifactorial including low maternal iron stores, reduced access to iron containing foods and increased infection rates and poor iron utilisation. These studies are not yet replicated in Australia however they provide sufficient information to identify a possible benefit from primary prevention strategies for IDA.

*Note: Aboriginal children do not have an additional genetic risk of IDA. The prevalence of IDA in some Aboriginal children can be attributed to low socio economic status (i.e. poor maternal iron stores, reduced access to iron containing foods and increased infection rates) or exposure to soil transmitted helminths.*

More background information on IDA can be found in Appendix A.

**Universal Prevention Strategies**

Community health staff have multiple roles in the prevention, early detection, management and monitoring of IDA in children. In relation to the primary prevention of IDA, the focus within WA will remain the promotion of a healthy iron rich diet for all pregnant women, new mothers, infants and young children serviced by child health services. Infants born at low birth weight and prematurely may require medical management to prevent and/or manage IDA.

Prevention of iron deficiency is particularly important for those identified as having risk factors (see previous section). The key strategies are:

- **Breastfeed for at least the first six months**\textsuperscript{12}
- **For those infants not breastfeeding, infant formula should be consumed until 12 months of age.** It is fortified with iron\textsuperscript{12}
- **Appropriate introduction of solid foods at around 6 months of age.** An infant’s iron stores start to decline from 6 months of age and their high iron needs can no longer be met by breastmilk or infant formula\textsuperscript{12}
- **Introduce iron rich foods first.** High iron first foods can include: iron-enriched infant cereals, pureed meat, fish or chicken, pureed cooked tofu and pureed legumes\textsuperscript{12}
- **Consume vitamin C rich foods (such as citrus fruits, berries and capsicum) with iron rich foods which will increase iron absorption.** Pureed or whole fruit and vegetables high in vitamin C are preferred over fruit juice\textsuperscript{9}
- **No consumption of tea for infants and young children.** Tea contains tannins and other compounds that bind iron and other minerals, thereby reducing their bioavailability.\textsuperscript{9,11}
- **Limit cow’s milk to no more than 500ml per day (over 12 months of age).**\textsuperscript{13,14} High intake of cow’s milk (which is a poor source of iron) in infants >12 months of age can result in IDA.

*Note: More information on iron rich foods and the types of iron in food (haem and non-haem) are in Appendix A.*
Secondary prevention is provided through the ongoing assessment of growth, development and wellbeing in children. Increased awareness of IDA, the associated risk factors and presenting symptoms will support opportunities for early detection. Where child and family assessment identifies increased risk factors or presentations active management can be initiated.

Assessment for IDA

Assessment for IDA should be undertaken within the context of a holistic clinical assessment. Given that most children are asymptomatic, the community health professional should review the child’s history and assess the:

- presence of risk factors
- child’s growth and development
- presenting appearance and behaviour.

Infants who are iron-deficient are often listless, irritable and tired. Other signs and symptoms of IDA in children can include:

- behavioural problems
- recurrent infections/illnesses
- loss of appetite
- lethargy
- breathlessness
- increased sweating
- faltering growth
- strange “food” cravings (known as pica) e.g. eating non-food items such as dirt, paper, washing detergent.1

In addition to a comprehensive nutritional assessment, a physical assessment aimed at detecting underlying illness should be undertaken. If IDA is suspected, the parent and carer should be provided with information about IDA and nutrition and either be tested or referred. See Assessment and Management Pathway for Anaemia on page 4 of this guideline.

Serial growth monitoring in conjunction with developmental assessment is important to identify deviation from normal expectations. Where deviation from normal expectations is identified further assessment should be undertaken to assess IDA risk factors and the associated signs and symptoms (see page 4).

The clinical pathway Weight and Growth Referral and Follow Up located in the CACH Growth in childhood guideline includes anaemia and is a useful guide to assist in determination of monitoring needs and direction of referral. Management plans will vary according to the contributing factors.

Documentation of services and assessments is essential and to be in compliance with the CACH and WACHS record keeping policies.
Anaemia in childhood

**Assessment and Management Pathway for Anaemia**

### Contributing Factors

- Premature birth
- Low birth weight
- Low iron stores in mother before and during pregnancy
- Delayed introduction to solid foods (later than 6 months)
- Low intake of iron-rich foods
- Drinking cow’s milk before 12 months
- Drinking too much cow’s milk >12 months
- Not eating enough food
- Recurrent infections
- Hookworm or other parasitic infections

### ACTIONS

#### 0-6 months

- Encourage breastfeeding on demand
- If child on infant formula, advise parents that the formula is iron-fortified
- Caution against use of cow’s milk
- Follow deworming management if needed, per local protocol
- Monitor growth and refer if growth is faltering

#### 6-12 months

- Encourage continued breastfeeding
- If child on infant formula, continue to 12 months
- Caution against use of cow’s milk
- Introduce iron-rich foods as first solid foods from 6 months
- Encourage intake of foods with Vitamin C at the same time as iron-rich foods to increase iron absorption
- Consider environmental issues such as access to food, residence in tropical areas,
  - Follow deworming management if needed, per local protocol
  - Monitor growth and refer if growth is faltering

#### >12 months

- Encourage iron-rich foods
- Encourage intake of foods with Vitamin C at the same time as iron-rich foods to increase iron absorption
- Discuss the amount of foods and number of meals/servings to have per day
- Determine if >500ml of cow’s milk the child is being consumed/day
- Discourage tea consumption
- Follow deworming management if needed, per local protocol
- Monitor growth and refer if growth is faltering
Testing for iron deficiency

When

Enhanced Aboriginal Child Health Service (EACHS)

The Enhanced Aboriginal Child Health Service (EACHS) is an additional schedule of contacts for children at increased risk of poor development and health outcomes.

The EACHS rationale states that local protocols for screening and treatment of anaemia should be implemented in regions where anaemia is a significant population issue. Otherwise, targeted assessment of symptomatic children is indicated.

How

A full blood count film and iron study is the most reliable method of testing for iron deficiency. However, for initial testing in a community health setting, a haemoglobinometer is a convenient method of obtaining a timely result. It is sensitive enough if the machine is calibrated and the specimen is collected using the correct technique.

Community health staff will follow the appropriate blood specimen collection procedures (Heel prick blood collection or Finger prick blood collection).

PathWest is the WA Health provider of pathology services and provides a reference range based on best available evidence. See Table 1 below.

<table>
<thead>
<tr>
<th>Age</th>
<th>Anaemia if Haemoglobin below the lower limit of the reference range below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>At birth</td>
<td>&lt;130 g/l</td>
</tr>
<tr>
<td>&lt;6 months*</td>
<td>95 g/l</td>
</tr>
<tr>
<td>6 – 12 months</td>
<td>105 g/l</td>
</tr>
<tr>
<td>1 - 4 years</td>
<td>110 g/l</td>
</tr>
<tr>
<td>5 – 7 years</td>
<td>115 g/l</td>
</tr>
<tr>
<td>8 -11 years</td>
<td>115g/l (KAMS and CARPA = 119 g/l)</td>
</tr>
</tbody>
</table>

Source: PathWest QEII Haematology Reference Data - Haematology Methods Manual 2012

*There is some variation in the values in the first five weeks. If in doubt refer to a GP.

The Community Health Professional’s Role in Management of IDA

Management of IDA is aimed at treating the child’s presenting anaemia and providing support to prevent future recurrences. All children with suspected iron deficiency should be discussed with or referred to a general practitioner for diagnosis and management in the first instance.

In rural WA the general practitioner role may vary and local knowledge about nurse practitioner and hospital based medical support is needed. Staff should adhere to local protocols.

A Kimberley region-specific protocol has been developed to guide clinicians in the prevention, assessment and management of anaemia. See Useful Resources section of this document.

Medical management includes the use of iron supplements, monitoring and parent/carer education. The role of the Community Health Professional is to:

- support compliance with prescribed supplements
• provide continued nutrition and dietary advice to the parent or carer
• provide advice to parent or carer on expectations of management of IDA
• continued monitoring on growth and development and liaison with prescribing practitioner and the family on progress and next steps
• follow-up on specific concerns that were identified at baseline assessment
• ensure screening and follow-up of children in the same household where appropriate
• discuss options for additional care if required by parents
• if anaemia recurs, then further plans should be developed with the parent/carer, including additional monitoring and support by the community health staff and/or referral to relevant health professionals.

Note: Iron supplementation may cause black bowel motions and children may become constipated when taking iron supplements. For nutritional advice on the iron content of foods and high fibre foods, refer to the chapter *Toddlers 1-3 years*, in the Child and Antenatal Nutrition (CAN) manual.
Anaemia in childhood

Appendix A - Background and general principles of IDA
Iron Deficiency Anaemia (IDA) is an important public health problem in Australia. The World Health Organization (WHO) estimates that 8% of preschool children, 12% of pregnant women and 15% of non-pregnant women of reproductive age in Australia have anaemia, with IDA being a major cause.¹ IDA is highly preventable and women and children with a nutritious diet are at low risk of IDA.

Effects of Iron Deficiency Anaemia (IDA)
Iron is an important dietary mineral involved in various bodily functions, including the transport of oxygen in the blood, which provides energy for daily life. Iron is also vital for brain development.² The rapid growth of the brain in the early stages of life makes infants more susceptible to iron deficiency. IDA is associated with faltering growth and stunting³ and neurodevelopmental delay.⁴ Suspected links between IDA and impaired performance in mental and motor development have been proposed. Infants with IDA have been shown to have poorer cognitive, motor and social/emotional functioning than healthy infants and associated with poorer outcomes in the long term for children with IDA.¹, ³ The behaviour of children with IDA may be affected as they are reported to be more tired, have difficulty concentrating, are ‘clingy’ and have reduced interaction with other children. These behaviours can lead to developmental delay. The behavioural effects of IDA may improve after treatment; however, some evidence suggests no improvement in cognitive effects.⁴

Iron content of food and types of iron
The iron content of some foods is presented in Table 4.⁵

<table>
<thead>
<tr>
<th>Food</th>
<th>Iron (mg)</th>
</tr>
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<tbody>
<tr>
<td>Breakfast cereal (iron fortified) 1 cup</td>
<td>3.0</td>
</tr>
<tr>
<td>Lean beef (cooked) 100 g</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Lean lamb (cooked) 100 g</td>
<td>2.0 - 2.5</td>
</tr>
<tr>
<td>Legumes – cooked ½ cup</td>
<td>2.0 - 2.5</td>
</tr>
<tr>
<td>Baked beans (small can 130g)</td>
<td>1.66</td>
</tr>
<tr>
<td>Salmon (canned or grilled) 100 g</td>
<td>1.1 - 1.3</td>
</tr>
<tr>
<td>Tuna (canned in water) 100 g</td>
<td>1.0 - 1.3</td>
</tr>
<tr>
<td>Egg – large 65-70g</td>
<td>1.0</td>
</tr>
<tr>
<td>Lean pork (cooked) 100 g</td>
<td>0.6 – 1.0</td>
</tr>
<tr>
<td>Skinless chicken breast (cooked no skin)100g</td>
<td>0.4 - 0.9</td>
</tr>
</tbody>
</table>

There are 2 different types of iron in food: haem (from animal sources) and non-haem (mainly from plant sources). The haem form of iron is more easily absorbed by the body than non-haem iron.⁵

1) Haem iron is found in red meat and to a lesser extent in fish and poultry.
2) Non-haem iron is found in wholemeal breads, breakfast cereals, vegetables (e.g. spinach, peas, and broccoli), legumes (e.g. baked beans) and eggs.

Enhancers of iron absorption
Vitamin C enhances the absorption of non-haem iron if consumed in the same meal. Encourage the consumption of vitamin C rich foods (such as citrus fruits, berries and capsicum) with non-haem iron foods. Whole fruit and vegetables high in vitamin C are
preferred over fruit juice.\textsuperscript{5} Consumption of meat, fish and poultry can also increase non-haem iron absorption from plant foods consumed at the same time.\textsuperscript{5}


References


## Related internal policies, procedures and guidelines

The following documents can be accessed in the Community Health Manual via the [HealthPoint](#) link or the [Internet](#) link

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Finger prick blood collection</td>
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<tr>
<td>Growth birth - 18 years</td>
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<tr>
<td>Growth Faltering</td>
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<tr>
<td>Heel prick blood collection</td>
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<tr>
<td>Physical Assessment 0-4 years</td>
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<tr>
<td>Neglect Protocol</td>
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</table>

## Useful external resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Link</th>
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<tbody>
<tr>
<td>Child and Antenatal Nutrition (CAN) Manual</td>
<td><a href="#">Intranet link</a></td>
</tr>
<tr>
<td>Kimberley Aboriginal Medical Services Council (KAMSC) and WA Country Health Service (WACHS) Kimberley: <em>Anaemia in Children (resource only for those working in the Kimberley)</em></td>
<td><a href="https://kahpf.org.au/clinical-protocols/">https://kahpf.org.au/clinical-protocols/</a></td>
</tr>
<tr>
<td>Raising Children Network – various nutrition related handouts for all ages</td>
<td><a href="http://www.raisingchildren.net.au">www.raisingchildren.net.au</a></td>
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</table>