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Anaemia in children under five years: African perspectives

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Abstract

Anaemia is a major public health problem in developing countries, contributing significantly to morbidity and mortality in children less than five years of age. It is considered to be a major public health problem with prevalence of 67%, equivalent to 83.5 million children in Sub Saharan Africa. Anaemia is one of the largest killers of children admitted to hospitals in Sub-Saharan Africa. Even where blood transfusions are available there is a significant case fatality rate of 6-18%. Characteristics most strongly associated with low Hb levels were age and sex of the child, place of birth, complementary foods their type and time of introduction, diseases especially malaria was significantly (30.8%) associated, low level of education and unemployment among caretakers. This seminar recommended health worker should encourage caregiver to children with anaemia to serve iron rich foods such as fortified baby cereal, pureed meats and pureed beans for infants and for older children red meats, chicken, fish, beans and spinach. the preventive strategies include continuous use of insecticide treated nets, iron Supplements to low birth weight infants and all other infants, fortification of foods, counseling on the type of complementary and weaning foods and intermittent anti-malarial treatment alongside vaccination.

Keywords: anemia, children, five years, developing countries

Introduction

Anaemia is a major public health problem in developing countries(Obeagu *et al.,* 2021; Obeagu and Agreen, 2023; Obeagu *et al.,*2022; Obeagu *et al.,*2023; Obeagu *et al.,*2023; Obeagu, 2018; Obeagu *et al.,* 2023). The global estimate of childhood anaemia indicates that 293.1 million of children under five years, approximately 43%, are anemic worldwide. Out of the 293.1 million children who are estimated to have anaemia in the world, 28.5% are found in Sub Saharan Africa (McLean *et al*, 2005), It is considered to be a major public health problem with prevalence of

67%, equivalent to 83.5 million children in Sub Saharan Africa (McLean *et al*, 2005). Anaemia is one of the largest killers of children admitted to hospitals in Sub-Saharan Africa. Even where blood transfusions are available there is a significant case fatality rate of 6-18% (Schellenberg *et al*, 2003). In East Africa, approximately 75% of fewer than five children are suffering from anaemia (Chatterjee *et al*, 2010).

Because of its low cost and feasibility, WHO has included evaluation of palmar pallor as the initial tool to detect severe anaemia in its algorithm for management of sick children (Chalco *et al*, 2005). Studies to look at specificity and sensitivity of palmar pallor to detect anaemia were done in Peru, Zanzibar, Uganda and Bangladesh. These studies found that palmar pallor was neither sensitive nor specific to detect mild to moderate anaemia with a sensitivity of 80.9% and specificity of 90.8%. The sensitivity and specificity was better in severe anaemia, 84% and 99% respectively.

In Uganda, 64% of children under five years of age and 30% of women of reproductive age (15–49 years) had Fe-deficiency anaemia in 2000–1(Uganda/Calverton). Findings of the most recent Uganda demographic and health survey (2006) show that the levels of anaemia in children and mothers in Uganda have actually gone up, with 73% of children aged 6–59 months and 49% of women aged 15–49 years child bearing age being anemic(UBOS & ORC Macro, 2006). The causes of anaemia vary in different settings; they include intestinal worms, malaria, HIV infection, nutritional deficiencies, hematological malignancies and chronic diseases like sickle cell disease. Anaemia in childhood can also result not only from events in childhood but also from socioeconomic status and maternal factors, like iron deficiency (Schellenberg, *et al*, 2003).

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Anaemia in under-five children

Anaemia in under-five children is defined as a hemoglobin level <11 mg/dl or children with hematocrit less than 33%. Worldwide, anaemia in under-five children is a major public health problem. Globally, 20 million infants were born with low birth weight (LBW) every year. Nearly, 3.6 million of them died before celebrating their 28 days, of whom almost two-thirds were located in Sub-Saharan Africa and Southern Asia. The effect of anaemia can extend up to postpartum period and even newly delivered baby may suffer from a reduced iron store problem up to one year. In developing countries, 46–66% of children under the age of five were affected by anaemia. African and Asian regions were the major contributor for a high burden of anaemia (WHO 2008).

The causes for anaemia in under-five children are complex. Among these, low birth weight, under nutrition, poor socioeconomic status, household food insecurity, duration of breast feeding, poor dietary iron intake, poor maternal educational status, diarrhea, fever, poverty, poor sanitation and hygiene, monotonous diet, parent's level of education, and maternal anaemia were the commonest contributors for under-five anaemia (Ngesa, 2014).

Prompt identification and treatment of anaemia lead to overall improvement of population health outcomes, improved physical exercise performance, and well-being that results in enhanced economic productivity.

Epidemiology of anaemia in under-five children

Anaemia is a global public health problem affecting both developed and developing countries, being more prevalent in children under five years and pregnant women (McLean *et al*, 2005). The global estimate indicates that 293.1 million of children under five years, approximately 43%, are anaemic worldwide and 28.5% of these children are found in sub Saharan Africa (McLean *et al*, 2005). In West Africa, a study involving 3 countries including Burkina Faso, Ghana and Mali, the prevalence of mild anaemia was 24.3%, moderate anaemia was 64.3% and severe anaemia was 10.6% (Magalhaes & Clement, 2011). In a study done in Uganda, anaemia was found to be a severe public health problem in children less than five years living around Lake Albert and Lake Victoria. The prevalence was 68.9% and 27.3% respectively (Green *et al*, 2011). A community-based study in Tanzania, involving under-fives conducted in Kilombero, Rufiji and Ulanga, the prevalence of mild, moderate and severe anaemia was 87% with Hb<11g/dl, 39% with Hb<8g/dl and 3% with Hb<5g/dl (Schellenberg *et al*, 2003).

In a study carried out in a rural area in western Uganda, Bushenyi district, the overall prevalence of anaemia among children under five years was 26.2%, the prevalence of mild, moderate and severe anaemia was 10.3% with Hb 10-10.9g/dl, 14.3% with Hb 7-9.9g/dl and 1.6% with Hb<7g/dl (Joyce *et al*, 2009).

Factors associated with anaemia in under-five children

The major causes of anaemia in children in developing countries are mainly low bioavailability of Fe from plant-based diets resulting in inadequate dietary intakes of Fe and limited use of Fefortified infant foods and cereals (Administrative committee on Coordination, 1987).

Iron deficiency in children results in neurological impairment and growth and developmental retardation, which may not be fully reversible (Granthom McGregor and Ani, 1999)

Fe deficiency is the primary cause of anaemia, although vitamin A deficiency and folate deficiency (Karyadi *et al*, 1996), malaria and hookworm infestations (Fleming, 1981) and HIV/AIDS (van den Broek et al, 1998) also result in anaemia.

In Tanzania, a study done at Muhimbili National Hospital showed anaemia was positively associated with malaria, malnutrition, HIV infection and low socioeconomic status (Villamor *et al*, 2000).

Diagnosis of anaemia in under-five children

In many health facilities the diagnosis of anaemia is problematic. This is usually done clinically and in the laboratory.

Clinical estimation

Because of its low cost and feasibility, WHO has included evaluation of palmar pallor as the initial tool to detect severe anaemia in its algorithm for management of sick children (Chalco *et al*, 2005). The seminar to look at specificity and sensitivity of palmar pallor to detect anaemia were done in Peru, Zanzibar, Uganda and Bangladesh. These studies found that palmar pallor was neither sensitive nor specific to detect mild to moderate anaemia with a sensitivity of 80.9% and specificity of 90.8%. The sensitivity and specificity was better in severe anaemia, 84% and 99% respectively. WHO advises this should be used in a primary care setting where haemoglobin estimation cannot easily be obtained (Chalco *et al*, 2005 and Kalter *et al*,1997).

Laboratory diagnosis of anaemia in under-five children

Measurement of haemoglobin (Hb) is one of the least accurate essential tests in most district hospitals in Africa. Reasons include poorly

maintained equipment, lack of supplies and quality standards, and inadequate training and supervision (Critchlely *et al*, 2005 and Lara *et al*, 2007). Gold standard methods for Hb assessment are expensive and often impractical. Many hospitals use the time-honored tests haematocrit packed cell volume as a proxy for Hb concentration, Hb being derived using a conversion factor (haemoglobin= haematocrit/3) (Lee *et al* 2008). Others have questioned the crude mathematic relationship between haematocrit and Hb levels, which in African children was found to be significantly different from 3, and modified by age (Quinto e*t al*, 2006 and Carneiro *et al*, 2007).

Moreover, haematocrit was poorly specific, underestimating the prevalence of anaemia by misclassifying 10%, 66% and 100% of individuals with haemoglobin< 11 g/dl, < 8 g/dl and < 5 g/dl respectively (Carneiro *et al* 2007). In another two paediatric cohorts haematocrit underestimated the prevalence of moderate anaemia, 6% and 10% when defined by Hb levels but respectively 2% and 3% when estimated by haematocrit (Quinto *et al*, 2006).

Alternative methods include HemoCue (Hemocue AB–Hb Photometer. Quest Diagnostics Ltd) which is a small machine that is very simple to operate and therefore can be used by both laboratory staff and clinical staff at the point of care (Neufeild *et al*, 2002). However, it is costly to perform since the disposable cuvettes (0.75 USD/ per test) makes it too expensive for routine use. The haemoglobin colour scale (HCS) was developed in collaboration with the WHO for use in resource-poor settings where there is no laboratory (Stott *et al*, 1995).

Conclusion

There was a very high prevalence of child anaemia noted in this rural district of Uganda, most prevalent among children aged 12 to 23 months. The prevalence of chronic malnutrition was also high and was associated with anaemia. There is need to invest in age specific measures to prevent anaemia, including routine screening and management, especially among children 6 to 23 months, children in the rural areas and those with low caregiver education.

Characteristics most strongly associated with low Hb levels were age and sex of the child, place of birth, complementary foods (their type and time of introduction), diseases especially malaria was significantly (30.8%) associated, low level of education and unemployment among caretakers.

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