

Anemia among Children: International Trends and Reasons

Hani Zoheir Deep Elkanash^{1*}, Ziad Nazem Zatar¹

¹Specialist Pediatrician, Primary Health Care Corporation (PHCC), Qatar

DOI: [10.36347/sasjm.2022.v08i08.004](https://doi.org/10.36347/sasjm.2022.v08i08.004)

| Received: 16.07.2022 | Accepted: 10.08.2022 | Published: 13.08.2022

*Corresponding author: Hani Zoheir Deep Elkanash

Specialist Pediatrician, Primary Health Care Corporation (PHCC), Qatar

Abstract

Review Article

Anemia is a significant risk factor for children's health because it causes growth retardation and has severe short and long-term consequences that result in morbidity and death. The present review article was conducted to review the literature for anemia in the international level among children. We reviewed the most updated literature. The results showed that anemia among children is a serious problem, particularly in India and Africa. Anemia among children can be attributed to malnutrition, iron deficiency, poverty, and some demographic variables related to mother including mother's anemia and mother's education. Taken together, anemia is a serious health problem due to its high prevalence, especially in developing countries, and its cognitive and developmental effects. Anemia impacts children's growth and development. Children's anemia has been linked to malnutrition, poverty, mother's education, and anemia.

Keywords: Anemia, children, health, India, Africa.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Overview of Children Anemia

Anemia is a significant risk factor for children's health because it causes growth retardation and has severe short and long-term consequences that result in morbidity and death (Islam *et al.*, 2022). The most visible nutritional disorder that developing countries face is childhood anemia, which is one of the world's major public health issues (Zhao *et al.*, 2012; Onyeneho *et al.*, 2019). It is especially prevalent in developing countries such as Africa and Asia, particularly Southeast Asia, where one out of every four people suffers from anemia; pregnant women and preschool-aged children are especially vulnerable (Kumar, 2014). According to the World Health Organization (WHO), Africa and Southeast Asia are the most at risk. Anemia affected approximately 66 percent of preschool-aged children and half of all women (Patra *et al.*, 2011).

Definition of anemia

Anemia is a medical condition in which the amount of red blood cells or the oxygen-carrying capacity of hemoglobin is insufficient to meet physiologic needs, which vary by age, gender, altitude, smoking status, and pregnancy status (WHO, 2015). Anemia is caused by a lack of iron in the body, which reduces the amount of hemoglobin, the protein that

transports oxygen throughout the body's tissues. Anemia can be caused by a variety of physiological malfunctions, including thalassemia, hormone disorders, autoimmune disorders, vitamin B12 and vitamin A deficiencies, and inherited disorders (WHO, 2015; Singh and Parihar, 2019).

General impacts of anemia

Anemia affects people of all ages, races, and ethnicities, including children, pregnant and nonpregnant women, men, and the elderly, but it primarily affects children (McLean *et al.*, 2009). Feeling tired or weak, poor ability to work, extreme fatigue, pale skin, chest pain, fast heartbeat or shortness of breath, headache, dizziness or light-headedness, cold hands and feet, inflammation or soreness of tongue, and other symptoms of anemia can occur, and it can cause the death of a newly born child, premature birth, or impede fetal growth (Mahashabde *et al.*, 2014). It can double the risk of pregnancy death and lead to poor physical and mental development in children (Lokare *et al.*, 2012).

Anemia is linked to poor cognitive and motor development in children and reduced work capacity in adults, both of which have an impact on a country's economic development. Iron deficiency anemia is also associated with adverse reproductive outcomes in pregnant women, including preterm delivery, low-birth-

weight infants, and decreased iron stores for the baby, which may lead to impaired development (Abu-Ouf *et al.*, 2015; Who, 2022).

Reasons leading to anemia

The etiology of anemia is multifactorial, and studies suggest that less than half of people suffer from anemia due to iron deficiency (WHO, 2011). Nutritional deficiencies, infectious and inflammatory diseases, and genetic hemoglobin iron-deficiency are all common causes of anemia (Kumar *et al.*, 2022). Maternal death is three times higher in women with IDA than without this condition (Daru *et al.*, 2018). In Ethiopia, Endris *et al.*, (2022) reported several factors leading to anemia among children including childhood malnutrition, anemia of the mother, increased rates of fertility, and general poverty status.

Infections cause anemia in up to 50% of cases after iron deficiency (Asobayire *et al.*, 2001). In developing countries, malaria and hookworms are common. Infection and anemia are linked in many African regions (Asobayire *et al.*, 2001). Hookworm, *Ascaris lumbricoides*, *Trichuris trichiura* are linked to anemia (Sanou *et al.*, 2012). Hookworm increased anemia risk in preschoolers in Africa (Faragher *et al.*, 2008). In West Africa, treating hookworm could prevent 4.2% of anemia cases in preschoolers, according to risk mapping (Magalhães *et al.*, 2011). Evidence-gathering Hookworm caused anemia in Ethiopia (Yimam *et al.*, 2016). However, some studies in Ethiopia found no link between intestinal Helminthes and anemia (Grimes *et al.*, 2016).

In India, the rising prevalence of childhood anemia and its potentially fatal consequences for millions of Indian children is a major source of concern. It is critical to understand the relevant associated factors with childhood anemia to reduce the frequency and severity level. In this context, Islam *et al.*, (2022) found the association using the Indian Demographic and Health Survey 2015-16 data and the chi-squared and gamma tests. They used multinomial logistic regression and ordinal logistic regression to determine the best model and the factors that influence anemia in India. The results of their study showed that children with highly educated mothers were 36.7 percent less likely to be anemic than children with uneducated mothers. They also found that children with anemic mothers were more likely to be anemic than children without anemic mothers. Children who were not stunted were less likely to be anemic than stunted children. They also reported that children aged 36-59 months were less likely than children aged 6-24 months to be anemic. In India, the diet in India is primarily low in iron concentration, and fragments of evidence revealed that low iron stock up is based on scattered surveys. It stands to reason that iron deficiency is the root cause of most anemic conditions (Mehta *et al.*, 2021). Anemia can result in decreased physical work capacity, poor maternal and perinatal

health outcomes, and delayed growth, cognition, and motor development in children (WHO, 2021).

Global prevalence of anemia among children

According to the World Health Organization (WHO), nearly 60.2 percent (95 percent confidence interval (CI) 56.6-63.7) of African children under the age of five have anemia, which can be caused by nutritional deficiencies, hemoglobinopathies, or infectious diseases (Tesema *et al.*, 2021; WHO, 2021).

In the most recent national Jordan Population and Family Health Survey (JPFHS) study in 2017-2018, the total prevalence of anemia among children aged 6-59 months was reported to be 32%. Most anemic children (21%) had mild anemia, while 11% and 1% had moderate and severe anemia, respectively (DOS, 2019). In comparison to previous national studies, the prevalence of anemia remained constant at 34% from 2002 to 2009, then fell slightly to 32% in 2012 and 2017-2018 (FAO, 2021). In 2002 and 2010, two nationwide micronutrient surveys were conducted to assess the prevalence of anemia, iron deficiency, and iron deficiency anemia among children aged 12-59 months. Iron deficiency (26.2 percent in 2002 versus 13.7 percent in 2010) and iron deficiency anemia (10.1 percent in 2002 versus 4.8 percent in 2010), as well as anemia (20.2 percent in 2002 versus 17 percent in 2010), have all decreased significantly (FAO, 2021; MOH, 2021). Anemia prevalence among children aged 6-59 months fluctuated, first decreasing from 32.6 percent in 2000 to 30.4 percent in 2010, then increasing to 32.7 percent in 2019 (WHO, 2021).

Children in low- and middle-income areas are disproportionately affected by iron deficiency anaemia; Western China is a prime example. Given the health risks associated with childhood anaemia and the large heterogeneity of published studies on the subject, we conducted a systematic review of the evidence on anaemia prevalence and associated factors in Western Chinese children under the age of five. In Western China, the prevalence of anaemia in children under the age of five ranged from 3.69 percent to 75.74 percent (median 42.54 percent (IQR 25.62 percent -52.56 percent)); the highest levels were in Qinghai province: 59.10 percent -75.74 percent (median 67.80 percent (IQR 64.70 percent -72.75 percent)); the highest levels were reported in the subgroup of children aged 6-12 months (median Anaemia characteristics prevalence was associated with regional contexts, individual sociodemographic and feeding behaviors, and nutritional program interventions (Du *et al.*, 2022).

CONCLUSIONS

In general, anemia is a serious health problem due to its high prevalence, particularly in developing countries from one side and to its impacts on health regarding cognition and development. Children are affected by anemia which, in turn, impacts their growth

and development. Across the literature, children anemia can be attributed to malnutritional status, poverty, some demographic variables such as the mother's education, mother's anemia.

REFERENCES

- Islam, M., Afroja, S., Khan, M., Alauddin, S., Nahar, M., & Talukder, A. (2022). Prevalence and Triggering Factors of Childhood Anemia: An Application of Ordinal Logistic Regression Model. *International Journal of Clinical Practice*, 2022. <https://doi.org/10.1155/2022/2212624>.
- Onyeneho, N. G., Ozumba, B. C., & Subramanian, S. V. (2019). Determinants of childhood anemia in India, *Scientific Reports*, 9, 16540–16547.
- Zhao, A., Zhang, Y., Peng, Y., Li, J., Yang, T., Liu, Z., ... & Wang, P. (2012). Prevalence of anemia and its risk factors among children 6–36 months old in Burma. *The American journal of tropical medicine and hygiene*, 87(2), 306-311.
- Kumar, R. (2014). Anemia: A Common Health Problem, Consequence and Diet Management Among Young Children and Pregnant Women. Biological Forum, Research Trend, Bilaspur, India.
- Patra, S., Pemde, H. K., Singh, V., Chandra, J., & Dutta, A. (2011). Profile of adolescents with severe anemia admitted in a tertiary care hospital in northern India. *The Indian Journal of Pediatrics*, 78(7), 863-865.
- Singh, S., & Parihar, S. (2019). Prevalence of anemia in under five-year-old children: a hospital-based study. *Revista Brasileira de Hematologia e Hemoterapia*, 6, 6.
- W. H. Organization. (2015). *Global Anaemia Prevalence and Number of Individuals Affected*, WHO, Geneva, Switzerland.
- W. H. Organization. (2015). *The Global Prevalence of Anaemia in 2011*, WHO Report, Geneva, Switzerland.
- Mehta, U., Dey, S., Chowdhury, S., Ghosh, S., Hart, J. E., & Kurpad, A. (2021). The association between ambient PM_{2.5} exposure and anemia outcomes among children under five years of age in India. *Environmental Epidemiology*, 5(1).
- E. McLean, M. Cogswell, I. Egli, D. Wojdyla, and B. De Benoist, "Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system, 1993-2005," *Public Health Nutrition*, vol. 12, no. 04, pp. 444–454, 2009. View at: Publisher Site | Google Scholar
- Mahashabde, P., Arora, V. K., Sharma, S., Shahjada, A., & Dabhi, H. M. (2014). Prevalence of anaemia and its socio-demographic determinants in pregnant women: a cross-sectional study in tertiary health care setup in central India. *National Journal of Community Medicine*, 5(01), 126-130.
- Lokare, P. O., Karanjekar, V. D., Gattani, P. L., & Kulkarni, A. P. (2012). A study of prevalence of anemia and sociodemographic factors associated with anemia among pregnant women in Aurangabad city, India. *Annals of Nigerian Medicine*, 6(1), 30.
- WHO. (2017). Nutritional anaemias: tools for effective prevention and control. Nov 13, 2017. <https://apps.who.int/iris/bitstream/handle/10665/259425/9789241513067-eng.pdf> (accessed Oct 11, 2021).
- World Health Organization (WHO). (2021). WHO Global Anaemia Estimates, 2021 Edition. Anaemia in Women and Children. Available online: https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children (accessed on 18 February 2022).
- Tesema, G. A., Worku, M. G., Tessema, Z. T., Teshale, A. B., Alem, A. Z., Yeshaw, Y., ... & Liyew, A. M. (2021). Prevalence and determinants of severity levels of anemia among children aged 6–59 months in sub-Saharan Africa: A multilevel ordinal logistic regression analysis. *PloS one*, 16(4), e0249978.
- Department of Statistics (DOS) and ICF. Jordan Population and Family Health Survey 2017–2018; DOS and ICF: Amman, Jordan; Rockville, MD, USA, 2019.
- FAO. Food and Nutrition Profile, Jordan. 2011. Available online: <http://www.fao.org/3/aq039e/aq039e.pdf> (accessed on 18 September 2021).
- Ministry of Health-Jordan; Global Alliance for Improved Nutrition (GAIN); United States Center for Disease Control and Prevention (CDC); United Nation Children's Fund (UNICEF). National Micronutrient Survey-Jordan 2010; Ministry of Health: Amman, Jordan, 2011.
- Serdula, M. K., Nichols, E. K., Aburto, N. J., Masa'd, H., Obaid, B., Wirth, J., ... & Sullivan, K. M. (2014). Micronutrient status in Jordan: 2002 and 2010. *European journal of clinical nutrition*, 68(10), 1124-1128.
- World Health Organization. Global Health Observatory Data Repository. Anemia in Children, 2021.
- Du, Y., Liao, Y., Leng, F., Li, L., Ye, R., Mao, Y., ... & Zhou, H. (2022). Anaemia prevalence and its associated factors in children under 5 years in Western China: a systematic review. *BMJ paediatrics open*, 6(1), e001185. doi:10.1136/bmjpo-2021-001185.
- Kumar, S. B., Arnipalli, S. R., Mehta, P., Carrau, S., & Ziouzenkova, O. (2022). Iron Deficiency Anemia: Efficacy and Limitations of Nutritional and Comprehensive Mitigation Strategies. *Nutrients*, 14(14), 2976. <https://doi.org/10.3390/nu14142976>.
- Daru, J., Zamora, J., Fernández-Félix, B. M., Vogel, J., Oladapo, O. T., Morisaki, N., ... & Khan, K. S. (2018). Risk of maternal mortality in women with severe anaemia during pregnancy and post

partum: a multilevel analysis. *The Lancet Global Health*, 6(5), e548-e554.

- Endris, B. S., Dinant, G. J., Gebreyesus, S. H., & Spigt, M. (2022). Risk factors of anemia among preschool children in Ethiopia: a Bayesian geo-statistical model. *BMC nutrition*, 8(1), 1-11. <https://doi.org/10.1186/s40795-021-00495-3>.
- Asobayire, F. S., Adou, P., Davidsson, L., Cook, J. D., & Hurrell, R. F. (2001). Prevalence of iron deficiency with and without concurrent anemia in population groups with high prevalences of malaria and other infections: a study in Cote d'Ivoire. *The American Journal of Clinical Nutrition*, 74(6), 776-782.
- Shaw, J. G., & Friedman, J. F. (2011). Iron deficiency anemia: focus on infectious diseases in lesser developed countries. *Anemia*, 2011.
- Sanou, D., & Ngnie-Teta, I. (2012). Risk factors for anemia in preschool children in sub-Saharan Africa.
- Faragher, E., Haan, J., van Lent, P. L., Rockett, K. A., Teo, Y., Richardson, A. (2008). Severe anemia in Malawian children. *N Engl J Med*.
- Soares Magalhães, R. J., & Clements, A. C. (2011). Mapping the risk of anaemia in preschool-age children: the contribution of malnutrition, malaria, and helminth infections in West Africa. *PLoS medicine*, 8(6), e1000438.
- Yimam, Y., Degarege, A., & Erko, B. (2016). Effect of anthelmintic treatment on helminth infection and related anaemia among school-age children in northwestern Ethiopia. *BMC infectious diseases*, 16(1), 1-8.
- Grimes, J. E., Tadesse, G., Gardiner, I. A., Yard, E., Wuletaw, Y., Templeton, M. R., ... & Drake, L. J. (2017). Sanitation, hookworm, anemia, stunting, and wasting in primary school children in southern Ethiopia: Baseline results from a study in 30 schools. *PLoS neglected tropical diseases*, 11(10), e0005948.
- https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children, retrieved in 6/8/2022.
- Abu-Ouf, N. M., & Jan, M. M. (2015). The impact of maternal iron deficiency and iron deficiency anemia on child's health. *Saudi medical journal*, 36(2), 146-149. <https://doi.org/10.15537/smj.2015.2.10289>.