

Etiology of Anemia in under 5 Years Old Age Children

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1. Introduction

Anemia is a worldwide public health problem that affects both developed and developing countries¹.

The groups most affected are pregnant women, children under the age of five years and, to a lesser extent, school-age children². In the developing world, 46-66% of children less than five years of age are affected³.

There are several kinds of anemia, produced by a variety of underlying causes. Based on morphology of red blood cells, hematologists tend to categorize anemia as microcytic, macrocytic or normocytic⁴. Causes of anemia can be multifactorial and often coincide, but the primary cause is a diet with inadequate iron sources⁵. Iron deficiency is indicated as the most common cause of anemia in under-five children with a smaller proportion due to other micronutrient deficiency such as folate, Vitamin B12⁶. Iron is an essential mineral in basic neural processes such as myelination, production of neurotransmitters, and energy metabolism⁷. Iron deficiency anaemia results from a variety of causes including inadequate iron intake, high physiologic demands in early childhood and iron losses from parasitic infections, especially malaria, are important factors contributing to the high prevalence of anaemia in many populations⁸. The role of iron deficiency in cognitive impairment and psychomotor development is also well recognized⁹. Poor school performance and work capacity in later years could result from iron deficiency anemia¹⁰.

2. Patients and Method

A cross sectional study was conducted on 477 patients, 121 were attending Al - Nuaman teaching hospital and 356 were attending Al - elwia pediatric hospital from first of February 2015 to the end of September 2015, place of work was both mentioned hospitals. Blood samples were drawn by venipuncture into different containers. One tube with EDTA; ethylenediamine tetraacetic acid, for determination of hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration. RBC's count, WBC's count, erythrocyte sedimentation rate (ESR). Peripheral smear was prepared and RBC's morphology was studied to know the type of anemia. Other tube was plain and blood was drawn for total iron binding capacity, serum iron and was allowed to clot at room temperature. Both tubes were sent to laboratory where immediate analysis was done. Anemia was diagnosed if hemoglobin was less than 11gm/dl as WHO standard¹¹ because WHO standard cut off point was used to identify anemia. Children less than 5 years with hemoglobin (Hb)

values of <11.0 g/dl were considered anemic. To categorize the degree of anemia, Hb cut-off values of anaemia for children 6 -59 months of age were mild 10.0-10.9 g/l, moderate 7.0-9.9 g/l and severe <7.0 g/l¹¹. After this basic classification which based on morphology further investigations were carried out to see the etiology like, reticulocyte count, liver function test, serum bilirubin level, hemoglobin electrophoresis, G6PD; glucose 6 phpsphate dehydrogenase, screening test.

3. Results

In the current study there were 121 patients from Al - numan teaching hospital and 356 patients from Al - elwia pediatric hospital, 273 (57.23%) were male, 204 (42.76%) were female, regarding age of the patients, from 1 to < 2 years there were 260 (54.5%), from 2 to < 3 years there were 123 (25.7%), from 3 to < 4 years there were 50 (10.4%) from 4 to < 5 years there were 44 (9.2%), 198 (41.5%) were in patients, 279 (58.4%) were from outpatients clinic, regarding Hb level, <7.0 there were 45 (9.4%), >7.0 to 9.9 there were 265 (55.5%), >10 to 10.9 there were 167 (35.0%), regarding peripheral smear there were 433 (90.7%) patients presented with hypochromic microcytic anemia, 31 (6.4%) had normochromic normocytic anemia, 5 (1.0%) had macrocytic anemia, 8 (1.6%) had mixed combined dificiency anemia, with further breakdown of microcytic anemia Thelessaemia minor were 25 (5.7%), iron dificiency anemias were 408 (94.2%), with further breakdown of normocytic anemia there were Hemolytic anemia 23 (74.1%), Hematological malignancy cases were 5 (16.1%) and Anemia of chronic disease were 3 (9.6%).

Table 1: Distribution of studied sample according to place of data collection (n= 477)

Hospital	No.	percentage %
Al - numan hospital	121	25.3%
Al - elwia pediatric hospital	356	74.6%

Table 2: Distribution of studied sample according to gender (n = 477)

Gender	No.	Percentage %
Male	273	57.23%
Female	204	42.76%

Table 3: Distribution of studied sample according to age (n = 477)

Age in years	No.	percentage%
1 - 2	260	54.5%
2 - 3	123	25.7%
3 - 4	50	10.4%
4 - 5	44	9.2%

Table 4: Hospitalization of patients (n = 477)

Hospitalization	No.	Percentage%
In patients	198	41.5%
outpatients	279	58.4%

Table 5: Distribution of studied sample according to severity of anemia (n = 477)

Hb level g / l	No.	Percentage %
< 7.0 severe anemia	45	9.4 %
>7. 0 to 9.9 moderate	265	55.5 %
>10. 0 to 10.9 mild	167	35.0 %

Table 6: Distribution of studied sample according to type of anemia (n = 477)

Peripheral smear	No.	percentage%
hypochromic microcytic	433	90.7%
Normochromic normocytic	31	6.4%
Macrocytic	5	1.0%
Mixed combined deficiency	8	1.6%

Table 7: Distribution according to type of microcytic anemia (n = 433)

Microcytic anemia	Frequency	Percentage%
Thelessaemia minor	25	5.7%
Iron deficiency anemia	408	94.2%

Table 8: Distribution according to type of normocytic anemia (n = 31)

Normocytic anemia	Frequency	Percentage%
Hemolytic anemia	23	74.1%
Hematological malignancy	5	16.1%
Anemia of chronic disease	3	9.6%

4. Discussion

Anemia is a major problem throughout the world, and It may lead to serious health problems, such as poor cognitive and motor development and behavioral problems in children¹². The number of patients in the current study was more in the Al – elwia pediatric hospital than in Al – numan teaching hospital this could be due to the fact that the former is a specialist pediatric hospital , while the later is a general hospital . In current study it was found that more males were suffering from anemia as compared to female. In the past this difference may be observed due to the fact that in our society males are given more importance than females and obviously in case of illness they are brought in hospitals earlier than females¹³, or An association with boys may be due to the faster growth of pre-school boys compared to girls, which results in a high iron demand that cannot be met by diet alone similar to Rosemary et al. in Bazil 2011¹⁴. In other studies in USA Johnson et al . 1994 and Himes et al. 1997, females are found to be mostly involved^{15, 16}. The statistically significant difference in prevalence of anemia between the ages can mainly be explained by the accelerated growth and consequent increased requirement for iron during the first years of life similar to Fernando et al . 2011 and Konstantyner et al . 2009 in northeastern Brazil^{17, 18}. As reported by Villapando et al . and Perkin et al ., that prevalence of malnutrition increases rapidly between 3 to 18 months and was highest among children who were 18-23 months of age similarly in present study^{19, 20}. There was high percentage of moderate anemia as shown by other study²¹. Peripheral smear shows Microcytic was noted in

most of these patients as noted in different studies^{13, 22}. Various studies support current finding that iron deficiency anemia is the commonest variety and after that common one is normocytic anemia^{13, 23}. Many Latin American countries use food fortified with iron and other micronutrients, promoting consumption in specific population groups such as children²⁴.

5. Conclusion

This study has shown that; the commonest variety of anemia from 1-5 years is the iron deficiency anemia with high percentage of male and moderately severe anemia .

6. Recommendation

Because of the severity of the public-health problem and the potential threat to health, survival and development of present and future generations, the prevention and the control of anemia should be given immediate priority in the health and nutrition sectors particularly preschool children who are not currently the target of anemia-prevention.. Further studies are needed to consider micronutrients status, parasite infestation, hereditary disorders, and environmental pollutants.

References

- [1] World Health Organization. The World Health Report 2002: Reducing risks, promoting healthy life. Geneva: World Health Organization; 2002.
- [2] World Health Organization. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia, Geneva: World Health Organization; 2008, 4 .
- [3] B. Lozoff and M. K. Georgieff, “Iron deficiency and brain development,” *Seminars in Pediatric Neurology*, 2006. vol. 13,no. 3, pp. 158–165.
- [4] Cessie S, Verhoeff FH, Mengistie G, Kazembe P, Broadhead R, Brabin BJ. Changes in hemoglobin level in infants in malawi effect of low birth weight and fetal anemia. *Arch Dis Child* 2002; 86: 182-7.
- [5] World Health Organization; Center for Disease Control and Prevention. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia [Internet]. Geneva: World Health Organization; 2008 [cited 2010 Oct 3]. 51 p. Available from: http://whqlibdoc.who.int/publications/2008/9789241596657_eng.pdf
- [6] Ewusie , Clement Ahiadeke , Joseph Beyene and Jemila S Hamid. Prevalence of anemia among under-5 children in the Ghanaian population: estimates from the Ghana demographic and health survey . *BMC Public Health* 2014, 14:626 <http://www.biomedcentral.com/1471-2458/14/626> .
- [7] Georgieff MK. Nutrition and the developing brain: nutrient priorities and measurement. *Am J Clin Nutr* [Internet] . 2007 [cited 2010 Feb 26];85(2Suppl):614–20. Availablefrom : <http://www.ajcn.org/content/85/2/614S.full.pdf>

- [8] Horton S, Alderman H, Rivera J. Copenhagen Consensus 2008 Challenge Paper. Hunger and malnutrition; 2008 (cited 2010 June).
- [9] <http://www.copenhagenconsensus.com/Default.aspx?ID=953>.
- [10] Manoj P. Menon and Steven S. Yoon . Prevalence and Factors Associated with Anemia among Children under 5 Years of Age—Uganda . The American Society of Tropical Medicine and Hygiene ., Am. J. Trop. Med. Hyg., 93(3), 2015, pp. 521–526 doi:10.4269/ajtmh.15-0102 .
- [11] Villalpando S, Shamah-Levy T, Ramirez-Silva CI, Mejia-Rodríguez F, Rivera JA: Prevalence of anemia in children 1 to 12 years of age: results from a nationwide probabilistic survey in Mexico. *Int J Epidemiol* 2003, 45:490–498.
- [12] WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1) (<http://www.who.int/vmnis/indicators/haemoglobin.pdf>, accessed [date]).
- [13] Nawal Mubarak Al-Qaoud , Entesar Al-Shami , Prasanna Prakash . Anemia and associated factors among Kuwaiti preschool children and their mothers . Alexandria Journal of Medicine (2015) 51, 161–166.
- [14] Aneela Zareen, Muhammad Rizwan Saleem, Rabia Haq et al . Pattern of Anemia in Children in Age Group 1 to 5 Years. P J M H S Vol. 10, NO. 1, JAN – MAR 2016 .
- [15] Rosemary Ferreira dos Santos , Eliane Siqueira Campos Gonzalez , Emídio Cavalcanti . Prevalence of anemia in under five-year-old children in a children's hospital in Recife, Brazil . *Rev Bras Hematol Hemoter.* 2011;33(2):100-104
- [16] Johnson-Spear MA, Yip R. Haemoglobin difference between black and white women with comparable iron status: Justification for race specific anemia criteria. *Am J Clin Nutr* 1994; 60: 117-21.
- [17] Himes JH, Walkar SP, Williams S, Bennet F, Grantham MC, Gregor SM. A method to estimate prevalence of iron deficiency and iron deficiency anemia in adolescent Jamaican girls. *Am J Clin Nutr* 1997; 65: 831-6.
- [18] Fernando Figueira. Recife, PE. Prevalence of anemia and associated factors in children aged 6-59 months in Pernambuco, Northeastern Brazil . *Rev Saúde Pública* 2011;45(3)
- [19] Konstantyner T, Taddei JAAC, Oliveira MN, Palma D, Colugnati FAB. Isolated and combined risks for anemia in children attending the nurseries of daycare centers. *J Pediatr (Rio J)*. 2009; 85(3):209-16. DOI:10.2223/JPED.1879
- [20] Villalpando S, Shamah-Levy T, Ramirez-Silva C, Mejia F. Prevalence of anemia in children 1 to 12 years of age. Results from a nationwide probabilistic Survey in Mexico *Salud Publica Mex* 2003; 45: 490-8.
- [21] Perkin SL. Examination of the blood and bone marrow. In: Wintrobe's clinical hematology 11th ed. Greer JP, Foerster J, Lukens JN, Roders GM, Paraskevas F, Glader B. editors William and Wilkins. Philadelphia 2004; 1: 3-25.
- [22] Muhammed idris , Anis- ur-rehman . Iron deficiency anaemia in moderate to severely anaemic patients . *J Ayub Med Coll Abbottabad* 2005 ; 17 (3).
- [23] Brugnara C, Zurakowsk D, Diczianio J. Reticulocyte hemoglobin content to diagnose iron deficiency in children. *J Am Med Assoc* 1999; 281: 2252-30.
- [24] Verma M, Chhalwal J, Gurmut K. Prevalence of anemia among urban school children of Punjab. *Indian Pediatr* 1999; 36: 1181-6.
- [25] Girish Shakuntal, Anil Shamrao Mane , Anemia in pediatric patients under five years old: A cross-sectional study , *Scholars Journal of Applied Medical Sciences (SJAMS) Sch. J. App. Med. Sci.*, 2016; 4(6B):2020-2022