

Received	2025/01/12	تم استلام الورقة العلمية في
Accepted	2025/02/06	تم قبول الورقة العلمية في
Published	2025/02/11	تم نشر الورقة العلمية في

Prevalence of anemia among children patients in Tripoli University Hospital

Halima Abdeljalil ALgadi, Shada Ibrahim, Amira Abudina

Department of Medical Laboratory Science, Faculty of Medical Science
and Technology-Tripoli, Libya

Hal.Algadi@sebhau.edu.ly

Abstract

This study aimed to assess the prevalence of anemia among children admitted to Tripoli University Hospital. This study includes 199 children who were admitted pediatric department at Tripoli University Hospital. Data for this study was collected from September - December 2022. Data collection on, age, gender, complete blood count (Sysmex), complete blood count (hemoglobin, mean corpuscular volume (MCV) was obtained from hospital archive files. The prevalence of anemia among children was 29.65%. The largest percentage was 57.63% among births from the age of 3 days to 20 months, then followed by 6-11 years was 16.95%. then from 12 to 15 years was 13.56%. The lowest percentage was in the age group of 1-5 years 11.86%. Out of 59 anemics, 76% had mild anemia, and 22 % had moderate anemia and 1.7% had severe anemia. The prevalence of anemia among children in this study was considered moderate, according to this study the most prevalent conditions were mild anemia while the severe type was the least.

Keywords: Anemia, hemoglobin, children, mean corpuscular volume, Tripoli University Hospital.

دراسة نسبة انتشار فقر الدم عند الأطفال المترددين على قسم الأطفال في مستشفى الجامعي طرابلس

حليمة عبد الجليل القاضي، شدى إبراهيم، اميرة أبو ذينة

قسم تقنية المختبرات الطبية، كلية العلوم والتقنيات الطبية طرابلس - ليبيا

Hal.Algadi@sebhau.edu.ly

الملخص

هدفت هذه الدراسة لدراسة مدى انتشار فقر الدم ما بين الأطفال المرضى في قسم الأطفال داخل المستشفى الجامعي طرابلس. عدداً للأطفال المرضى في هذه الدراسة الاسترجاعية كان 199 طفل من داخل قسم الأطفال بمستشفى الجامعي طرابلس. تراوحت اعمارهم ما بين 3 ايام الى 15 سنة كان منهم 106 اناث و93 ذكور، و منهم 55 اعمارهم ما بين 3 ايام الى سنة و144 طفل تراوحت اعمارهم من اكثر من سنة الى 15 سنة، تم تسجيل مستوى الهيموجلوبين متوسط حجم كريات الدم الحمراء، متوسط تركيز الهيموجلوبين متوسط كمية الهيموجلوبين عدد كريات الدم الحمراء من ملفات المرضى داخل القسم، بعد تسجيل النتائج تم تقسيم الحالات الى اربع مجموعات على حسب الفئة العمرية، الفئة العمرية الاولى المواليد الذين تراوحت اعمارهم 3 ايام الى 20 شهرا، الفئة العمرية الثانية اعمارهم اكثر من سنة الى 5 سنوات، الفئة العمرية الثالثة اعمارهم اكثر من 5 - اقل من 12 سنة، اما الفئة العمرية الرابعة تراوحت اعمارهم من 12 - 15 سنة. من خلال النتائج المتحصل عليها في هذه الدراسة وجد ان نسبة فقر الدم كانت 29.65% وكانت 57.63% منهم عند الفئة العمرية من 3 ايام إلى 20 شهرا، ثم تليها 6-11 سنة 16.95%. ثم 12 إلى 15 سنة 13.56%. أقل نسبة كانت في الفئة العمرية من 1-5 سنوات 11.86% ومن بين 59 مريضاً كانوا مصابين بفقر الدم، 76% منهم يعانون من فقر الدم الخفيف، و22% يعانون من فقر الدم المتوسط، و1.7% يعانون من فقر الدم الشديد وهذه النسبة تعتبر متوسطة الحدة ووفقاً للمعايير التي وضعتها منظمة الصحة العالمية، ومن النتائج وجد ان معظم الحالات كانت تعاني من فقر دم كان خفيف بنسبة 76% وايضا اغلب الحالات كان نوع فقر الدم صغير الكريات وناقصة الصباغة بنسبة 66%.

الكلمات الدالة: فقر الدم، أطفال، الهيموجلوبين، متوسط كريات الدم الحمراء، المستشفى الجامعي طرابلس.

Introduction

Anemia is a condition where the number of red blood cells or the haemoglobin concentration within them is below normal levels. Haemoglobin is crucial for transporting oxygen, so having insufficient or abnormal red blood cells, or inadequate hemoglobin, reduces the blood's ability to deliver oxygen to the body's tissues. [1]. It is a basic well-being concern since it influences development and energy levels unfavorably. It happens at all age gatherings however is more common in pregnant ladies and youngsters. [2]. It harms invulnerable systems and is additionally connected with expanded dreariness [3]. Around the world, 20 million newborn children were brought into the world with low birth weight consistently. Almost, 3.6 million of them kicked the bucket before commencing their 28 days, of whom close to 66% were situated in Sub-Saharan Africa and Southern Asia [4]. The impact of weakness can stretch out up to the post-pregnancy period and, surprisingly, recently conveyed children might experience the ill effects of a diminished iron stockpiling issue as long as one year [5]. It is assessed that 24.8% (~1.62 billion individuals) of the worldwide populace is experiencing frailty. Assessed paleness predominance is 47.4% (~293 million) in preschool-matured kids, which is most noteworthy specifically age gatherings. [6]. Improvement of weakness among under-five-year-old children is multifactorial. Many elements add to the event of weakness, including organic, financial, natural, well-being and sustenance. Presently, it's true that the high pervasiveness of pallor among under-five-year-old youngsters emerges from the blend of expanded ironnecessities because of sped-up development and improvement, and is fundamentally connected with counts calories poor in heme iron. [7]. In less than five-year-old kids, iron deficiency causes despondency of the resistant framework with expanded affinity for contamination; and decrease of mental capability, development and psychomotor turn of events, which prompts hardships in learning and diminished actual limit. [8] These progressions might endure even after suitable medication treatment. [9]. The present study was done to determine the prevalence of anemia in children who were admitted to Tripoli's University hospital

Materials and Methods

The study group was selected among patients' children admitted to the Department of pediatrics at Tripoli University Hospital- Libya, from September - December 2022. The study was composed of 199 children 'aged 3 days to -15 years. The selection was first based on the results of their complete blood count (Sysmex) using an automated cell counter (Sysmex), Data collection on, age, gender, and Hemoglobin levels mean corpuscular volume (MCV) were obtained from hospital archive files.

Statistical analysis

Statistical analysis was performed using Microsoft Excel, Professional Edition 2013. Descriptive statistics (means and percentage) are mostly presented.

Results

This study included the data of 199 children in the Pediatric Department, at Tripoli University Hospital. The study population comprised 55 children their age (3 days -20 months), 59,52, and 33 children their ages (1- 5 years), (6- < 12 years), and (12-15) respectively. Of the total of 199 children presented to the hospital, the majority of them 104 (52.3%) were females and 95 (47.7%) were males. out of 199 children 59 (29.65) % of children were suffering from anemia.in figure (1).

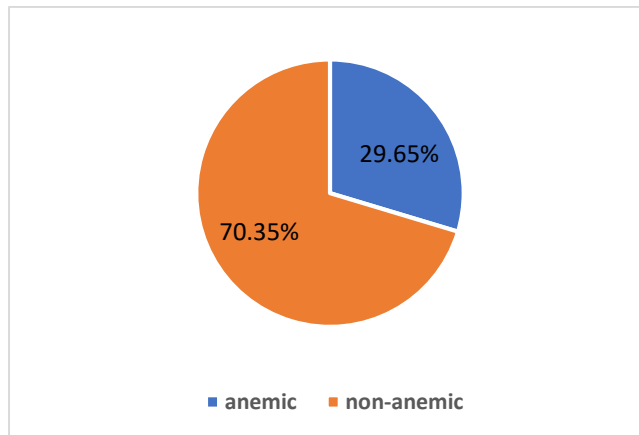


Figure (1) prevalence of anemia among children

Based on gender distribution, male children showed a slightly higher prevalence of anemia than females 50.9% and 49.1% respectively from total anemia as Table 1.

Table (1) Prevalence of anemia according to sex

Gender	Number of patients N=199	Anemic Total =59	
		No	Percentage
Male	95	30	50.9%
Female	104	29	49.1%

As per the division according to age groups, children of the age group between (3 days and -20 months) 34 (57.63%) was more suffered from anemia as compared to other age groups in the present study. Table 2

Table (2) Distribution of anemia by age group among children

Anemic	Number of patients Total= 59	Percentage
3days-20 months	34	57.63%
1-5 years	7	11.86%
6- 11years	10	16.95%
12-15years	8	13.56%

Out of 59 anemia 41 children (69.5%) less than 5 years and 18 children (30.5%) more than 5 as Figure 2.

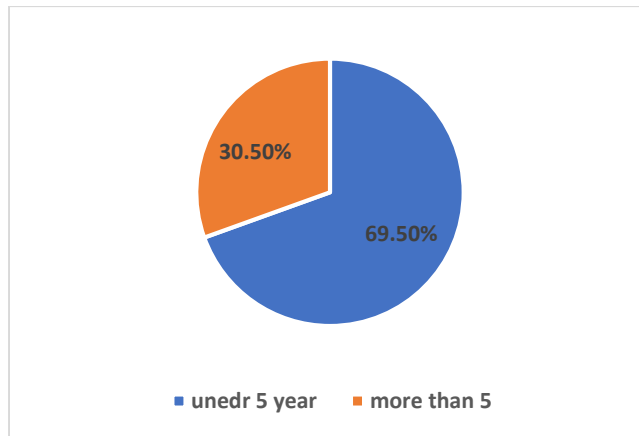


Figure (2): Distribution of anemia by age group among anemic children

According to the severity of anemia, 45 (76.3%) children have mild anemia, 13 (22%) children have mild anemia, and 1 (1.7%) child have severe anemia, Table 3

Table (3) Distribution of the children according to severity of anemia.

Anemia	Number of patients	Percentage
Mild	45	76.3%
Moderate	13	22%
Sever	1	1.7%
Total	59	100%

Distribution of the children according to types of anemia, 39 (66%) children have microcytic hypochromic anemia, 19 (32%) children have normocytic normochromic anemia, and 1 (1.7%) children have macrocytic anemia, Table 4.

Table (4) Distribution of the children according to types of anemia

Type of Anemia	Number of all anemic	percentage
Microcytic hypochromic	39	66.1%
Normocytic normochromic	19	32.2%
Macrocytic anemia	1	1.7%

Discussion

The prevalence of anemia among children aged 6 to 59 months worldwide in 2019 reached about 39.8%, which equates to 269 million children suffering from anemia. The prevalence of anemia in children under five years of age reached 60%, which is the highest in Africa. Failure to reduce anemia may lead to the suffering of many women, impair children's health, reduce their concentration, and delay their education. [10] Anemia is an indicator of poor health and poor nutrition. The World Health Organization has set criteria for diagnosing anemia. Children aged between 6-59 months have a hemoglobin level of less than 11 g/dl, Hemoglobin less than 11.5 g/dl in children aged 5–11 years, Hemoglobin less than 12 g/dl for children aged 12–14 years and Hemoglobin less than 13 g/dL in newborns. [11]. According to WHO criteria, the severity of anemia is classified as severe anemia: Hb <7.0g/dl; moderate anemia: Hb 7.0-8.9g/dl; and mild anemia: Hb 9.0-10.9g/dl. [12]. Microcytic anemia is defined as MCV of less than 80 femtoliters (fl), normocytic anemia as MCV from 80-100 fl, and macrocytic anemia as MCV more than 100 fl. [13]. This study' overall prevalence of anemia was 29.65%. Out of the study subjects, 31.5% of males and 27.9% of females were anemic. The prevalence of anemia in the present study 29.65% is similar to the prevalence that found Sunardi *et al* in their study on

children aged 6–36 months old in Indonesia, was 29.4%, [14], that percentage was less than that of , which was according to a study done in Derna in Eastern Libya 65.11%, [15], Also was lower than the previous studies in health facilities in rural Nigeria 68%, [16], Western China (51.2%), [17] Sudan (70.5%), [18] Cape Verde West Africa (51.8%), [19], Nigeria (70.5%), [20] Tanzania (37.9%), [21], in Mali 88% [22]. In contrast, this finding was higher than reports from Iraq 25.16% [23], Brazil (10.2%) [24] Sub-Saharan Africa (9.7%) [25] and Beijing (North China) 11.8%. [26]. The This variation in the prevalence of anemia could be due to the patients in this study were suffering from different diseases, geographical variation, socioeconomic status, variation in the method of determination, and sample size.

In this current study, the most cases of anemia were mild, 45 (76.3%) and moderate, 13 (22%). while the Severe anemia was found in 1 (1.7%) children, these findings were agreement with similar studies conducted in Iraq [23], Ethiopia [27] and China [28].

Anemic children were grouped by age, the children between the age group 3days-20 months were the most affected age group compared to the older children, several studies, including those conducted in [23- 29-30-31] support our findings. In infants under the age of two, this is likely due to maternal micronutrient deficiencies. Children born to malnourished mothers often have insufficient stores of iron, vitamins A and B12, and folate, zinc. Additionally, low level of iron in breast milk may not adequately meet the daily iron needs of these infants. Conversely, older children have a reduced risk of infections and diseases that can hinder iron absorption [32] Furthermore, as children's growth rates decrease, their iron requirements per kilogram of body weight also lower, and the transition from complementary foods to regular table foods becomes significant [33-34-35]

The present study showed a high prevalence rate of Microcytic hypochromic anemia among anemic children. This result is consistent with Sunardi *et al* in Derna and WHO which shows that iron deficiency is the most common cause of anemia [36]. According to the WHO, anemia can be defined as a mild, moderate and severe public health problem when the prevalence is 5–19.9%, 20–39.9% and greater than 40%, respectively. Therefore, the

prevalence of anemia in this study is considered a moderate public health concern. [37].

There are limited studies investigating the prevalence of anemia in children under five years of age in Libya. various causes of anemia among children under the age of five years. Among these reasons are low birth weight, malnutrition, poor social and economic situation, duration of breastfeeding, insufficient intake of iron in food or malabsorption, infectious diseases, low educational level of the mother, Diarrhea, fever, poverty, inadequate Health care and hygiene, healthy diet, and malnutrition in parents. Education level and maternal anemia were the most common contributing factors to anemia in children under five years of age [38,39]. In this study, all cases suffered different diseases and various infectious (pneumonia ‘Celiac disease ‘Chronic disease ‘Diabetes Mellitus Type I, Acute Gastroenteritis, Biliary Atresia, Cellulitis, Fever, Septic Arthritis, Urinary Tract Infection) that may be caused by anemia in children in the present study.

Conclusion

- Based on the WHO classification of anemia, our study's prevalence was moderate.
- Anemia prevalence in the group aged (3 days -20 months) was high compared with other groups in study.
- There was an Increased prevalence of mild Microcytic Hypochromic anemia in overall anemic samples, while severe anemia was the least.

References

- [1] Kassebaum NJ, Jasrasaria R, Naghavi M, et al. (2014). A systematic analysis of global anemia burden from 1990 to 2010. *Blood* 123: 615–624.
- [2] United Nations Children’s Fund, United Nations University, WHO (2001) Iron deficiency anemia. Assessment, prevention and control - A guide for program managers. World Health Organization, Geneva, 15-31.

- [3] WHO. (2002). The World Health Report: Reducing risks, promoting healthy life. World Health Organization, Geneva. 49-93.
- [4] T. M. Wardlaw, (2004). Low Birthweight: Country, Regional and Global Estimates, Unicef, New York, NY, USA.
- [5] F. Mardones, A. Rioseco, M. Ocqueteau et al., (2003). "Anemia in pregnant women from the community of puente alto, chile," Revista Medica de Chile, vol. 131, no. 5, pp. 520–525.
- [6] Benoist B, McLean E, Egli I, Cogswell M. (2008). Worldwide prevalence of anemia 1993-2005: WHO Global Database on Anemia. World Health Organization, Geneva. 7-13
- [7] Assuncao MC, Santos IS, Barros AJ, Gigante DP, Victora CG. (2007). Anemia em menores de seis anos: estudo de base populacional em Pelotas, RS. Rev Saude Publica. 41:328-35.
- [8] Grantham-Mcgregor S, Ani C. (2001). A review of studies on the effect of iron deficiency on cognitive development in children. J Nutr. 131:649-68.
- [9] Lozoff B, Jimenez E, Hagen J, Mollen E, Wolf AW. (2000). Poorer behavioral and developmental outcome more than 10 years after treatment for iron deficiency in infancy. Pediatrics. 105: E51.
- [10] World Health Organization. (2021) Anaemia in Women and Children. Geneva: World Health Organization. WHO Global Anaemia estimates.
- [11] World Health Organization (WHO). (2011). Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. :1–6.

- [12] WHO (2006). multicentre growth reference study group WHO child growth standards based on length/height, weight and age. *ActaPædiatrica*. 450:76–85.
- [13] Fonseca A.C., Silva D.P., Infante J., Ferro J.M. (2021). Cerebrovascular Complications of Anemia. *Curr. Neurol. Neurosci. Rep.* 21:51. doi: 10.1007/s11910-021-01141-y.
- [14] SunardiD, BardosonoS, Ray W. Basrowi, Wasito E and Vandenplas Y. (2021). Dietary Determinants of Anemia in Children Aged 6–36 Months: A Cross-Sectional Study in Indonesia. *Nutrients* .13, 2397
- [15] Aziza M. Alsheekh and Amal S. Alhassadi. (2019). Anemia among Children Aged 1 month -12 Years at Al-Wahda Hospital, Derna-Libya. *Al-Mukhtar Journal of Sciences*. 34 (2): 112-116,
- [16] Obasohan BE, Stephen J. Walters, Jacques R. KhatabK. (2022). Individual, household and area predictors of anaemia among children aged 6–59 months in Nigeria, *Public Health in Practice*. 3. 100229.
- [17] Gao W, Yan H, Dang S, Pei L, Pei L. (2013). Severity of anemia among children under 36 months old in rural western China. *PLoS One*. ;8(4): e62883. doi:10.1371 /journal.pone.0062883
- [18] Badria A Elfaki. (2022). Prevalence of Anemia Among Children and Adolescents in Sudan. *International Journal of Early Childhood Special Education*. (INT-JECSE)
- [19] Semedo RM, Santos MM, Baião MR, Luiz RR, da Veiga GV. (2014). Prevalence of anemia and associated factors among children below five years of age in Cape Verde, West Africa. *J Health PopulNutr.* ;32(4):646.
- [20] Oladeinde BH, Omoregie R, Olley M, Anunibe JA, Onifade AA, Oladeinde OB. (2012). Malaria and anemia among

children in a low resource setting in Nigeria. Iran J Parasitol. 7(3):31.

- [21] Innocent B. Mboya, Mamseri R, Beatrice J. Leyaro¹, George J, Sia E. Msuya, Melina Mgongo. (2023). Prevalence and factors associated with anemia among children under five years of age in Rombo district, Kilimanjaro region, Northern Tanzania [version; peer review: approved, approved with reservations]. F1000 Research, 9:1102.
- [22] Gebreegziabher T and Sidibe S. (2023) Prevalence and contributing factors of anaemia among children aged 6–24 months and 25–59 months in Mali. J Nutr Sci. 12: e112. Nov 9
- [23] Ibrahim ZH, Shallal AF, Hussein SH, Ibrahim RH, Mustafa BH, Abdullah SM, Hamad AH (2020). Prevalence of anemia among children of Ranya District: Kurdistan Region, Northern Iraq. EurAsian Journal of BioSciences Eurasia J Biosci .14, 7659-7665 (2020).
- [24] Novaes TG, Gomes AT, Silveira KC, et al. (2017). Prevalence and factors associated with anemia in children enrolled in daycare centers: a hierarchical analysis. Revista Paulista de Pediatria. 35:281–288.
- [25] Muoneke VU, Ibekwe RC, Nebe-Agumadu HU, Ibe BC. (2012). Factors associated with mortality in under-five children with severe anemia in Ebonyi, Nigeria. Indian Pediatr. ;49(2):119–123.
- [26] QinruiLi ,Furong Liang , Weilan Liang , Wanjun Shi , Ying Han.(2019) Prevalence of Anemia and Its Associated Risk Factors Among 6-Months-Old Infants in Beijing. Front Pediatr. Jul 12:7:286.
- [27] Melku M, Alene KA, Terefe B, Enawgaw B, Biadgo B, Abebe M, et al. (2018). Anemia severity among children aged

- 6-59 months in Gondar town, Ethiopia: a community-based cross-sectional study. *Ital J Pediatr.* ; 44(1)
- [28] Huixia Li, Juan Xiao, Minghui Liao, Guangwen Huang, Jianfei Zheng, Hua Wang, Qun Huang and Aihua Wang. (2020). Anemia prevalence, severity and associated factors among children aged 6–71 months in rural Hunan Province, China: a community-based cross-sectional study. Li et al. *BMC Public Health* .20:989
- [29] Kejo, D., Petrucka, P.M., Martin, H., Kimanya, M.E. and Mosha, T.C., (2018). Prevalence and predictors of anemia among children under 5 years of age in Arusha District, Tanzania. *Pediatric health, medicine and therapeutics*, 9, p.9.
- [30] Shet, A., Mehta, S., Rajagopalan, N., Dinakar, C., Ramesh, E., Samuel, N.M., Indumathi, C.K., Fawzi, W.W. and Kurpad, A.V., (2009). Anemia and growth failure among HIV-infected children in India: a retrospective analysis. *BMC pediatrics*, 9(1), p.37.
- [31] Villalpando, S., de la Cruz, V., Shamah-Levy, T., Rebollar, R. and Contreras-Manzano, A. (2015). Nutritional status of iron, vitamin B12, folate, retinol and anemia in children 1 to 11 years old. Results of the Ensanut 2012. *Saludpublica de Mexico*, 57(5), pp.373-384.
- [32] Ewusie, J.E., Ahiadeke, C., Beyene, J. and Hamid, J.S., (2014). Prevalence of anemia among under-5 children in the Ghanaian population: estimates from the Ghana demographic and health survey. *BMC public health*, 14(1), p.626
- [33] Gebreegziabiher, G., Etana, B. and Niggusie, D., (2014). Determinants of anemia among children aged 6–59 months living in KilteAwulaeloWoreda, northern Ethiopia. *Anemia*
- [34] SelomonAssefa, AndualemMossie, Leja Hamza. (2014). Prevalence and severity of anemia among school children in

Jimma Town, Southwest Ethiopia. BMC Hematol. 16;14(1):3.
doi: 10.1186/2052-1839-14-3.

- [35] Jocelyne E Elusive Clement Ahiadeke², Joseph Beyene¹ and Jemila S Hamid¹. (2014). Prevalence of anemia among under-5 children in the Ghanaian population: estimates from the Ghana demographic and health survey. Ewusie et al. BMC Public Health.14:626.
- [36] Pita, G.M., Jiménez, S., Basabe, B., García, R.G., Macías, C., Selva, L., Hernández, C., Cruz, M., Herrera, R., O'Farrill, R. and Calderius, I. (2014). Anemia in children under five years old in Eastern Cuba, 2005-2011. *Medic Review*, 16, pp.16-23
- [37] World Health Organization. (2011). Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity 1–6 (World Health Organization)
- [38] R. D. Semba, S. de Pee, M. O. Ricks, M. Sari, and M. W. Bloem, “(2008). Diarrhea and fever as risk factors for anemia among children under age five living in urban slum areas of Indonesia,” *International Journal of Infectious Diseases*.12, (1) pp. 62–70
- [39] A. Desalegn, A. Mossie, and L. Gedefaw, (2014). “Nutritional iron deficiency anemia: magnitude and its predictors among school-age children, southwest Ethiopia: a community-based cross-sectional study,” *PLoS One*. 9, (12)