



## Tikrit Journal of Pharmaceutical Sciences

Available online at: <https://tjphs.tu.edu.iq>

ISSN: 1815-2716(print); ISSN: 2664-231X (online)



T. J. Ph. S.

### Estimation of Some Blood Parameters in Anemic Children Patients

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#### ARTICLE INFO.

##### Article history:

-Received: 30/1/2022

-Accepted: 4/4/2022

-Available online: 16/12/2022

##### Keywords:

*anemia, ferritin, children.*

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##### Citation:

Faris MA, Azeez FS, Hameed EA.  
Estimation of Some Blood  
Parameters in Anemic Children  
Patients. Tikrit Journal of  
Pharmaceutical Sciences. 2022;  
16(1):39-49.

<http://doi.org/10.25130/tjphs.2022.16.1.5.39.49>

#### Abstract

A cross sectional study was conducted for a sample of 45 anemic children and 15 healthy children (control group) in five primary health care centers in Hawija district in Kirkuk governorate. All children were between 6-60 months old. The study started from April 1 to August 31, 2021. Anemia was diagnosed by ferritin, Hb, RBCs, PCV, and WBCs tests. The role of gender and age in anemia was studied, and the results were as follows: The group of patient's children showed a deterioration in the levels of the studied hematological variables, whose values reached 10.977 ng/ml, 10.287 g/dl for ferritin and hemoglobin, and for the effect of patients' gender, it was found that males were more affected by anemia, as they recorded poor averages in both study groups, reaching Their averages in the patient group were 9.104 ng/ml, 10.09 g/dl for Ferritin, Hb Respectively, as for the age of patients, it was found that children under three of age were more affected by anemia, as they recorded the lowest averages of the studied variables, which amounted to 10.09 ng/ml and 9.67 g/dl for the category of those under three years of age for Ferritin and Hb on respectively within the patient group, and 116.9 ng/ml, 13.95 g/dl for Ferritin and Hb for the least healthy group of children of three years.

## تقدير بعض المتغيرات في دم الاطفال المصابين بفقر الدم

### الخلاصة

أجريت الدراسة المقطعية الشاملة لعينة مكونة من ٤٥ طفلاً مصاباً بفقر الدم و ١٥ طفلاً أصحاء (المجموعة الضابطة) في خمسة مراكز رعاية صحية أولية في قضاء الحويجة في محافظة كركوك. كان عمر جميع الأطفال بين ٦-٦٠ شهراً. بدأت الدراسة من ١ أبريل إلى ٣١ أغسطس ٢٠٢١. تم تشخيص فقر الدم عن طريق اختبارات الفيريتين ، الهيموغلوبين ، كرات الدم الحمراء ، PCV ، وكرات الدم البيضاء. تمت دراسة دور الجنس والعمر في فقر الدم ، وكانت النتائج على النحو التالي: أظهرت مجموعة أطفال المريض تدهوراً في مستويات المتغيرات الدموية المدروسة والتي بلغت قيمها ١٠.٩٧٧ نانوغرام / مل و ١٠.٢٨٧ جم / ديسيلتر للفيريتين و ١٠.٢٨٧ جم / ديسيلتر. الهيموجلوبين ، وللتأثير على جنس المريض ، وجد أن الذكور كانوا أكثر تأثراً بفقر الدم ، حيث سجلوا متوسطات ضعيفة في مجموعتي الدراسة ، حيث بلغ متوسطهم في مجموعة المرضى ٩.١٠٤ نانوغرام / مل ، ١٠.٠٩ جم / ديسيلتر من أجل فيريتين ، خضاب الدم على التوالي ، أما بالنسبة لعمر المرضى ، فقد وجد أن الأطفال دون سن الثالثة كانوا أكثر تأثراً بفقر الدم ، حيث سجلوا أدنى متوسطات للمتغيرات المدروسة ، والتي بلغت ١٠.٠٩ نانوغرام / مل و ٩.٦٧ جم / ديسيلتر لفئة أولئك الذين تقل أعمارهم عن ثلاث سنوات للفيريتين والهيموغلوبين على التوالي ضمن مجموعة المرضى ، و ١١٦.٩ نانوغرام / مل ، و ١٣.٩٥ غرام / ديسيلتر للفيريتين والهيموجلوبين الأطفال الاصحاء ذو الثلاث سنوات.

## **Introduction**

The definition of anemia is a reduction in the amount of hemoglobin in the blood below normal values with regard to the sex and age of persons, and although it is defined physiologically and pathologically as a decrease in the total mass of red blood cells (RBCs) in the Blood circulation, it can be defined functionally as a decrease in the ability of the blood to carry oxygen Hence tissue hypoxia <sup>[1]</sup>. The definition of anemia in the World Health Organization as the point at which the amount of hemoglobin in the circulation decreases according to the estimates of the World Health Organization for specific sex and age category. Anemia is a global problem with complex causes and is associated with many factors <sup>[2]</sup>.

In some cases, unrelenting anemia is caused by deficiencies in micronutrients such as vitamin B12, folic acid, and vitamins A, as well as certain blood loss diseases and parasitic infections, according to a side story. "Anemia in children under the age of five is associated with a vitiated assertive on toss mental development and social functioning." Children with fierce scantiness anemia close the first twosome years of vitality take on poor academic performance and slower cognitive development <sup>[4]</sup>. Anemia body a tricky and acute effect suitability function on a national crisis, impost in developing countries, overwhelming a objectively high proportion of biologically vulnerable groups such as children. Unmoving paucity has been identified as the most superbly habitual legate of anemia but size have battle-cry they are level pegging to be utterly identified fitted they differ with mature, copulation,

socioeconomic conditions, and prevalence of other causes of anemia <sup>[5]</sup>. Anemia is characterized by a place hemoglobin (Hb) attention, incandescent chamber prophesy, or with teen apartment volume, with subsequent impairment in meeting tissue hypoxia needs. Hemoglobin prominence and narrative anemia are affected by personal/individual type such as age and gender, as lavishly as environmental factors such as smoking and altitude <sup>[6]</sup>. The causes of anemia butt be multifactorial and ever conform, but the unspecific vehicle is a making containing sketchy sources of horrible (quantitative and qualitative); ghastly insufficiency causes an estimated 50% of cases of anemia worldwide <sup>[7]</sup>.

Iron deficiency anemia (IDA) in early life is associated with altered behavioral and neurological development <sup>[8]</sup>. Although the most common manifestation is anemia, iron deficiency is often a source of host neurological disorders seen in general pediatric neurological practices. These disorders include developmental delay, seizure, stroke, breath-holding spells, pseudotumor cerebri, and cranial nerve palsy <sup>[9]</sup>. Neurological symptoms such as irritability, short attention span, breath-holding spells, learning disability, sleep disturbance, memory impairment, papilloedema, pseudotumor cerebri, sixth nerve palsy and behavioral disturbances due to iron deficiency are well known. Iron plays a major role in transporting oxygen to various tissues such as the brain. In the metabolism of various neurotransmitters and enzymes such as aldehyde oxides and monoamine oxidase. It is thought that iron deficiency may

alter a child's seizure threshold. Hence, iron deficiency is hypothesized to be a potential risk factor among children with anemia<sup>[10]</sup>.

The current study aims to assess the effect of anemia in children less than six years old on ferritin levels and hemoglobin, and knowing its relationship to the gender and age of patients.

### **Materials and Methods**

A cross-sectional study was undertaken on a 45-pound ape in two waggish fine-fettle solicitude institutions in Kirkuk governorate's Hawija region. In the workplace, wean away from the examination from 1 April to 31 August, 2021. Facts were unexcited by guileless put to use urgency a special questionnaire to obtain information. Anemia was diagnosed by ferritin tests and manifold bust markers. Far patients were investigated at the age of response by contacting the outpatient limb who appeared to attempt clinically undernourished as the cause of anaemia. For the ever patient, a plentiful recital was phony. Within the last two months, we have secretly allowed getting blood repair or blood transfusions.

The study included a group of healthy 15 children, (9) of whom were males and (6) females, who were proven to be uninfected after conducting laboratory tests on them by the specialized doctor and they had no family history of hereditary diseases of blood diseases and all ages were less than Six years (6-60 months).

Blood samples were collected and kept in a proper way to ensure the most important components of the model study, through which reliable results can

be obtained in diagnosing the disease. Therefore, many considerations were taken during the collection of samples, such as the use of disposable syringes, samples were collected between 8-10 a.m., after which blood was drawn from the vein using a (5) ml syringe, and (1) ml of the drawn blood was placed in new EDTA tubes containing an anticoagulant for the purpose of measuring some Hematological variants such as Hb.

While 4 ml of the blood sample drawn in a plain tube remained at room temperature for 30 minutes and then placed in a centrifuge for ten minutes at a speed of (3000) rpm to separate the serum, for the purpose of measuring serum ferritin (SF), and the blood serum was kept By freezing it at a temperature of (-20) °C in the main blood bank to maintain its enzymatic activity until appropriate tests are performed.

### **Hematological Test**

**Ferritin level measurement:** Serum ferritin levels were obtained by automated quantitative testing using a vidas machine or by ELFA (enzyme-linked fluorescence assay), using vidas biomerieux france<sup>[11]</sup>.

### **Determination Concentration**

**Hemoglobin:** Add 5 ml of Drabkin's solution dissolved in a little distilled water and (prepared from 1 g of sodium bicarbonate and 50 mg of potassium cyanide and fill the volume with distilled water to (1) liter to a test tube and add to it (0.02) ml of the drawn and preserved blood with a blocking agent EDTA anticoagulant. The mixture was left for 10 minutes and then the mixture was read on a Spectrophotometer at wavelength 540 nm<sup>[12]</sup>.

**Inclusion Criteria:** Children between 6-60 months

**Exclusion Criteria :** out of (6-60) limits.

**Statistical analysis:** After collecting the data and entering it into the computer, it was classified using Microsoft Office Excel, and the averages were calculated for the groups and groups studied according to the Duncan polynomial method and the standard deviation was extracted using the SAS statistical analysis program [13].

**Results**

Table (1) shows the effect of anemia on ferritin levels and some blood indicators for the two groups of children under study. It is noted that the blood indicators deteriorated in the group of sick children compared to the control group. The averages of the studied variables were 10.977 ng/ml, 10.287 g/dl in the patient group and they were 81.966 ng/ml, 13.16 g/dl for Ferritin, Hb respectively, where the results showed significant differences between the two study groups for all variables ( $p \leq 5$ ).

**Table (1): Effect of anemia on hematological variables of two groups of children.**

Group	Ferritin (ng/ml)	Hb (g/dl)
Patients	10.977 b ±4.057	10.287 b ±1.731
Control	81.966 a ±62.205	13.16 a ±0.891

The values followed by the same letter do not differ significantly ( $p \geq 5$ ) from each other for each variable.

Table (2) shows the effect of the gender of anemic patients on ferritin levels and some blood indicators for the two groups of children under study. It is noted that the worst averages of the

studied variables were 9.104 ng/ml, 10.09 g/dl, in the male group within the patient group, while the best averages were 107.61 ng/ml, 13.3 g/dl, in the female category within the control group for Ferritin, Hb, RBCs, respectively, and the results of the statistical analysis showed significant differences between the two study groups for all variables. Table (3) shows the effect of the age of anemic patients on ferritin levels and Hb for the two groups of children under study. It is noted that the worst averages of the studied variables amounted to 10.09 ng/ml and 9.67 g/dl for the category of those under three years for each of Ferritin and Hb respectively, in the more than three-year category within the group of patients, while the best The averages were 116.9 ng/ml, 13.95 g/dl, for Ferritin, Hb, respectively for the healthy children <3 years group, for the healthy group of more than three years, and the results of the statistical analysis showed that there were significant differences between the two study groups for all variables

**Table (2): Effect of the gender on hematological variables of anemic patients and control groups.**

Group	Gender	Ferritin (ng/ml)	Hb (g/dl)
Patients	Male	9.104 b ±2.644	10.009 c ±1.877
	Female	16.128 b ±2.296	11.05 b ±1.085
Control	Male	43.5 a ± 1.920	12.95 a ±0.495
	Female	107.61 a ±70.94	13.3 a ±1.179

The values followed by the same letter do not differ significantly ( $p \geq 5$ ) from each other for each variable.

**Table (3): Effect of the age on hematological variables of anemic patients and control groups.**

Group	Age (year)	Ferritin (ng/ml)	Hb (g/dl)
Patients	≤3	10.09 c ±3.567	9.67 d ±1.754
	>3	12.75 c ±4.805	11.52 c ±0.841
Control	≤3	116.9 a ±97.70	13.95 a ±0.495
	>3	28 b ±58.67	12.6 b ±12.63

The values followed by the same letter do not differ significantly ( $p \geq 5$ ) from each other for each variable.

### Discussion

The modern-day examine showed that anemia is a severe hassle among pre-college children in Hawija metropolis. The World Health Organization has defined anemia as Hb <11.0 g/dL [14]. About (66%) of youngsters be afflicted by anemia. According to the type of the World Health Organization, this have a look at indicated that anemia need to be considered a severe fitness problem. Anemia is found in 27% of kids aged 1-6 years within the Philippines, forty four% in kids elderly 3-five years in India, and 24% in youngsters elderly 2-five years in Romania [15].

The results of the current study indicated deterioration and decrease in blood values in the group of children with anemia, and these results are in agreement with the results of the study of Khanna *et al.* [16] who mentioned that all the blood values were lower in the group of patients compared to the control group, and they indicated that the mean ferritin level in the blood was  $39.54 \pm 24.55$  and the control was  $51.29$

$\pm 20.26$ , and then we found that the level of ferritin in the blood in the anemic group of patients It was significantly low, the cutoff point for serum ferritin was arbitrary, and they reported that in the anemic group, 36 of the 75 children had ferritin less than 30 ng/dL (about 48%). In the control group, only 17 children had a blood ferritin level of less than 30 ng/dL (22.66%). Note Daoud *et al.* [17] the serum ferritin level was significantly reduced in the anemic group of patients compared to the control group provided that serum ferritin is a touchy and dependable dimension for figuring out iron deficiency at an early stage and can be the satisfactory indicator of general iron fame inside the body. A low serum ferritin stage may decrease the seizure threshold and febrile seizures, as iron is vital for the feature of an exclusive part of the enzyme and neurotransmitter within the principal frightened gadget [16].

Agostoni *et al.* [22] confirmed that the prevalence of anemia amongst completely breastfed youngsters changed into (38.1%), and specific breastfeeding for extra than (6 months) will increase the probability of growing anemia because (90 %) of the iron requirement comes of supplemental feeding. In addition, in a current take a look at performed in Pakistan on solely breastfed babies and IDA, it became located that (26.1%) of completely breastfed toddlers were iron poor [23]. This may be because of the kid's want for extra iron than that acquired from breastfeeding [24]. Also, one of the most vital causes of anemia among pre-college children is their exposure to parasitic worms. An observe Al-Sa'idi and Ma'ala [25] %confirmed that (50.7)

of the children have been inflamed with hookworms and that this aspect A sizable association with anemia changed into shown in preschool youngsters. Reported by using Jennifer *et al.* [26] that hookworm infection has lengthily been identified some of the main reasons of anemia in terrible groups and is related to low hemoglobin ranges in youngsters. Also [25] %indicated that there may be a sturdy link among parental employment and hemoglobin ranges. Parental paintings, and mainly father's paintings, seems to be related to prices of anemia amongst youngsters. One feasible rationalization is that parental employment capabilities as a proxy for socioeconomic fame, which is known to be inversely related to anemia and kid's trendy dietary status. Low degree of schooling and unemployment might also lead to low degree of social and economic status. This is likely to reproduce nutritional deficiencies, irritation and recurrence of infection, likely increasing the prevalence of anemia. Moreover, education is related to the capacity to spread recognition vital for proper health care and vitamins for kids, and therefore a low degree of training can growth the chance of anemia [27]. The have a look at by using Kahigwa *et al.* [28] showed that children with anemia had caregivers who did now not entire the primary level of training. This is similar to what changed into discovered in the have a look at Al-Zuheiry *et al.* [24] that there may be a significant correlation among the low instructional level of the daddy, the non-working mother (housewife) and anemic youngsters. Furthermore, Keikhaei *et al.* [29] said that an illiterate younger mother with a negative own family is

much more likely to have kids with anemia. One of the maximum essential predictors of anemia in preschool youngsters is the circle of relative's wealth index [30], as the low wealth index has a considerable association with anemia, in line with what turned into referred to [27] variations in consequences among these research can be because of variations in age groups, races, group sample sizes, and dietary reputation of the kids underneath examine.

Several studies of preschool children reported differences in the prevalence of sex-related anemia, with males being more anemic than females, and this was similar to our finding that males were more anemic than females with significant differences due to male entry More than females are hospitalized, especially in rural areas with a higher prevalence of anemia than in urban areas [31], a finding similar to that found by Abdi Guled *et al.* [1] in more than two thirds of anemic children from rural areas. Which can be attributed to many reasons (the mother's upbringing, the mother in the countryside has many duties in addition to taking care of the child, the number of family members in the countryside was more than that in the urban area). In the study of Khanna *et al.* [16] The incidence of anemia in males was higher than in females, as it was 61.33% of males (46 out of 75) and 38.66% of females. Sharif *et al.* [32] %reported a higher prevalence of anemia in males compared to females. Shaheed and Abbas [33] %study also concluded that anemia is more common in males, and mean hemoglobin, PCV, MCV, serum iron and serum ferritin were lower among anemic children. In

contrast, the study of Mamiro *et al.* [34] conducted in Tanzania there was no association between anemia and the gender of patients, and Leal and Filho [35] in Brazil found that the difference between the sexes did not show an association with anemia, as the study of Al-Sa'idi and Ma'ala [25] showed In Sadr City in Baghdad, one third of the study sample suffers from moderate anemia, and this study showed that only the father's job, and low family income achieved a significant relationship with anemia in preschool age and other social and demographic characteristics that are not important (gender, parental education level, weight child and its height).

The consequences of the present day take a look at showed that children below 3 years of age are more likely to broaden anemia, and that is in agreement with many preceding studies. It became cited [36] that maximum kids with anemia have been much less than 24 months' antique, and the common age of youngsters with from anemia 27.16 months. The prevalence of anemia at a younger age could be because of the immaturity of the mind as maximal hippocampal increase has been determined to occur before the age of 3 years. This is the electricity of a natural mind mutation that is believed to decorate neural excitability. Leal and Filho [35] conducted a observe to determine the capacity threat factors associated with anemia in children below the age of five, and the consequences confirmed that the distribution of anemia by means of age institution will increase inside the first years via (38.Three%), whilst on the age of 3 to 5 years the percentage of youngsters reached

respondents (25.Four%), and attributed this to one reason for this lower being that older children gain from a greater diversity of food selections than younger youngsters, and those effects are regular with the observe of [37] where the superiority of anemia at the age of much less than 24 months turned into more than that of older youngsters, and the modern-day effects are in agreement with the results of the observe of Shaheed and Abbas [33] who confirmed that the massive majority of anemia takes place among 6 months and 3 years, with an average age (17.Five  $\pm$  eight.81) months, with a higher occurrence of seizures in boys than in ladies. This statistically big distinction in the prevalence of anemia among a long time can be defined in particular via the increased boom and the resultant boom inside the call for for iron all through the first years of existence. Breastfeeding is likewise one of the causes of anemia in younger age agencies, and this will be due to the reality that breast milk includes a minimum quantity of iron to fulfill the growing nutritional necessities of toddlers, for the reason that provision of breast milk on my own coupled with speedy iron depletion for more than six months increases It additionally increases the hazard of anemia in younger youngsters [38]. Also, early publicity of babies (before six months of age) to microbial pathogens due to complementary foods 'increases hazard' of diarrheal sicknesses, and for this reason malabsorption [39]. While other effects indicated that children with negative dietary variety are probably to have anemia due to a lack of micronutrients within the weight loss plan, and on the causes of anemia it was



found that (67.9%) had been iron deficiency anemia, this low attention of hemoglobin in kids, it could be because of micronutrient deficiencies (specifically iron) on account of malnutrition<sup>[40]</sup>.

### **Conclusion and Recommendation**

The results of the current study show that anemia has a significant negative impact on blood parameters in children within the age of six years, and it was found that males are more affected by anemia, and that children under the age of three years are more affected than those over this age. Thus, we recommend periodic monitoring of children's health indicators and taking nutritional and health recommendations to avoid them contracting anemia because of the subsequent health problems in the main body systems and the deterioration of the growth curve.

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