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Frequency of iron deficiency anemia among children with poor appetite complaint

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Abstract

Iron deficiency anemia (IDA) in children causes both mental and psychomotor impairment. This study was planned to investigate the frequency of iron deficiency anemia in children with poor appetite. Complete blood count and ferritin values of children admitted to the pediatric outpatient clinic due to poor appetite were analyzed retrospectively. Cases with a hemoglobin (Hgb) value below -2 SD and a ferritin level below 12 ng/ml according to the age group were considered as IDA. Four hundred and twenty-eight children aged between 6 months and 18 years were evaluated. 210 (49.06%) and 218 (50.94%) of children were male and female, respectively. Children were examined in four groups according to their age: 1) 6 months-2 years (n=193), 2) 3-6 years (n=142), 3) 7-11 years (n=67) and 4) 12-17 years (n=26). Children were divided into three groups according to their ferritin values: Group 1: ≥12 ng/ml (n=299), Group 2: between 6-12 ng/ml (n=95) and Group 3: ≤6 ng/ml (n=34). The rate of IDA was found to be 28.2% in children with a ferritin value of ≤12 ng/ml. The relationship between age and gender to the frequency of anemia was not statistically significant (p≥0.05). IDA is a common hematological disorder that can be seen at any age, especially in children aged 6-36 months. In children with poor appetite, the presence of iron deficiency should be investigated.

Keywords: Anemia, iron deficiency, appetite, ferritin

Introduction

Young children and their mothers are particularly impacted by the major global public health issue of anemia. WHO estimates that 40% of pregnant women and 42% of children under the age of five worldwide, in other words 1.9 billion people, are anemic. It may ocur due to a variety of reasons such as overindulgence of dietary fats, salt or sugar-induced chronic inflammation, chronic kidney disease, gynecological and gastrointestinal malignancies, and autoimmune disorders [1]. Anemia is defined as a reduction in red blood cells (RBCs), which results in a reduction in hematocrit and hemoglobin (Hgb) concentration [2]. A decrease in Hgb might impair cognitive and motor growth, lead to weariness, and result in low productivity. The anemia burden in low-resource settings will be decreased through increased research and improved population-level strategy implementation [3].

Iron need is maximum during early childhood period. Iron deficiency at that period may cause irreversible neurodevelopmental and cognitive deficits. Iron deficiency anemia (IDA) is most likely to be diagnosed when hypochromia and microcytosis are present in a complete blood count. While both medical and non-medical interventions can help avoid iron shortage, oral ferrous sulphate is the least expensive and most practical treatment for IDA [4].

Measurement of Hgb concentration is a useful way to understand chronic nutritional status and blood oxygen carrying capacity [5]. Screening and diagnosis of IDA can be a burden because it may require testing for Hgb, ferritin, and an inflammatory biomarker [6]. According to standards for iron deficiency staging, mild anemia is defined as having serum ferritin levels below 60 mcg/dL, whilst severe anemia is defined as having serum ferritin levels below 40 mcg/dL [7].

Improvences on diet is an effective way to manage iron deficiency in children with IDA and should be considered in the

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overall strategy of IDA management [8]. Most common causes of under-five anemia are low consumption and malabsorption of iron-rich foods [9].

Cow's milk formula consumption and zinc intake are highly associated with anemia [10]. In humans, dietary molybdenum has been shown to treat IDA [11]. IDA and a lack of appetite are related. The hormone ghrelin primarily controls hunger. IDA patients have decreased appetites and contradicting higher ghrelin hormone activity compared to healthy controls. IDA treatment increases appetite and lowers ghrelin levels [12]. Plasma ghrelin level elevates, leptin level reduces and growth accelerates because of a boost in appetite and daily calories, carbs and protein amount in children with nutritional IDA after iron therapy. The boost in appetite and acceleration on growth in IDA may result from reduced leptin and elevated plasma ghrelin levels [13].

In IDA hypochromia and microcytosis are present in the peripheral blood, hematocrit values are low, serum iron is decreased, iron binding capacity is elevated, ferritin values are decreased. Serum ferritin levels are a canon that reflects body iron stores [14] .In this study, we aimed to assess the prevalence of IDA in children who lack appetite.

Material and Methods

In this study, hospital records of 428 children aged 6 months to 18 years, who were admitted to the "Elazig Fethi Sekin City Hospital Pediatric Hematology Outpatient Clinic" (Elazig, Turkey) between 2019 and 2021, were retrospectively analyzed for the presence of IDA and iron deficiency profile. Patients with any chronic disease and thalassemia were excluded from the study. Hgb, hematocrit (Hct), mean erythrocyte volume (Mean Corpuscular Volume = MCV), erythrocyte distribution width (Red Cell Distribution Width = RDW) and ferritin values of the children were examined and compared to age group normal values.

Children were examined in four groups according to their age: 1) 6 months-2 years (n=193), 2) 3-6 years (n=142), 3) 7-11 years (n=67) and 4) 12-17 years (n=26). Children were divided into three groups according to their ferritin values: Group 1: ≥12 ng/ml (n=299), Group 2: between 6-12 ng/ml (n=95) and Group 3: ≤6 ng/ml (n=34)). According to age group suitability, those with Hgb value below "-2 SD" and ferritin level below 12 ng/ml were considered as IDA.

Statistical analysis

The Statistical Package for the Social Sciences 15.0 for Windows was used to conduct the analyses. To investigate the associations between nominal variables, the chi-square test was applied. The Pearson correlation test was used to assess the level of correlation between numerical variables, while the t-test and one-way ANOVA analysis of variance were employed to analyse the difference between the Ggroup means. The difference between the groups was considered significant when $p<0.05$.

Ethical considerations

The study protocol was approved by the Elazığ Fethi Sekin Pediatrics Hospital, Hematology-Oncology Department, Ethics Committe 04-E.1900164326, 2011-KAEK-27/2019-1900152520).

Results

In this study, 428 children aged between 6 months and 18 years were evaluated who were brought to hospital due to poor appetite. Of the children, 210 (49.06%) were male and were female. Children were examined in four groups, as 6 months to 2 years (n=193), 3-6 years (n=142), 7-11 years (n=67) and 12-18 years (n=26).

The Hgb, Hct, MCV, RDW and ferritin values of children according to their age groups are given in Table 1.

Table 1. The Hgb, Hct, MCV, RDW and ferritin values of children

	n	Minimum	Maximum	Average	DF
Hgb (g/dl)	428	6.6	16.7	11.652	1.2852
Hct (%)	428	21.9	73.1	35.436	3.8161
MCV (fl)	428	26.2	91.7	75.134	6.6163
RDW (%)	428	12.4	34.4	14.924	2.9757
Ferritin (ng/ml)	428	1.65	182.4	25.691	20.7065

According to the ferritin values, the children were divided into three groups as Group 1 (>12 ng/ml, n=299), Group 2 (6-12 ng/ml, n=95) and Group 3 (<6 ng/ml, n=34). The rate of patient with a ferritin value <12 ng/ml (IDA) was found to be 28.2%. The relationship between age groups and gender and the frequency of anemia was not statistically significant ($p\geq0.05$). The relationship between the group determined according to age groups and ferritin levels is shown in Table 2.

Table 2. The relationship between age groups and groups determined by ferritin levels

Age groups	Groups according to ferritin levels			Total
	≥12 ng/ml	6-12 ng/ml	≤6 ng/ml	
Six months to 2 years	131	41	21	192
Three to 6 years	96	37	10	143
Seven to 11 years	52	13	1	66
Twelve to 18 years	21	5	2	28
Total	299	95	34	428

Discussion

Anemia affects 293 million (47%) children younger than 5 years (3) and responsible for many manifestations [4] such as chronic inflammation, chronic kidney disease, gynecological and gastrointestinal malignancies, and autoimmune disorders (1), cognitive and motor development and cause fatigue and low productivity in children [3].

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The 28.2% ferritin value we obtained in this study was between the values of developed countries and developing countries which were determined by WHO. A higher IDA rate between 6 and 36 months may be due to weaning from breast milk and giving cow's milk in the early period. In a study including 2.223 children aged 0-17, conducted in Hacettepe Children's Hospital, the rate of IDA was found to be high (25.8%), similar to our results, IDA was most common between the ages of 6-24 months, followed by the 2-6 age group [15]. In a study conducted by Kirikkale University, a high rate of iron deficiency was found in 73% of children aged 4-23 months [16].

IDA in children aged between 2-6 month is not expected because of the iron in breast milk is more absorbable than diet iron. Nevertheless additional foods such as cow's milk besides breast milk within first 6 months might affect the absorbation rates [17]. Inadequate iron intake despite the increase in iron requirement during rapid growth, high intake of phosphate and phtates that affect iron absorption from the intestines, intestinal parasites such as Giardia lamblia, that prevent iron absorption by covering the small intestinal mucosa, more plant-based foods instead of animal derived foods in diet, blood loss caused by bleeding diathesis and recurrent diarrhea are the many reasons of IDA in children. In addition, cow's milk consumption may lead to IDA by causing blood loss from the intestine [18]. In this study, more cow's milk consumption and nutritional deficiencies were found in the 6-36 month age group as the most common causes in children with IDA.

Conclusion

IDA was determined as a common hematological problem and an important cause of poor appetite in children which needs to be further investigated.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
The study protocol was approved by the Elazığ Fethi Sekin Pediatrics Hospital, Hematology-Oncology Department, Ethics Committe 04-E.1900164326,2011-KAEK-27/2019-1900152520).

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