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Risk factors for iron-deficiency anemia in infants aged 6-12month old

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***Abstract*---**Background: Even though the frequency of iron deficient anemia has declined in the last years, It has been the most prevalent nutritional deficit in the world. Objective: To evaluate the prevalence and etiology due to iron shortage anemia in 6- to 12-month-old babies. Patients and method: This study is a hospitalized-based study performed in a central teaching hospital in Baghdad, from 1st March 2021 to 1st February 2022, to assess the incidence also underlying causes of IDA in infants between six months and 12m of age. full history was taken from the mothers, an assessment of nutritional status done to all cases. Infants (n=133) had their mean corpuscular volume, hemoglobin, Evaluation of serum ferritin, serum iron, also total iron-binding capability. Anemia was defined as hemoglobin levels below 10.5 g/L, serum ferritin levels below 12µg/L, then iron deficiency as ferritin levels also mean corpuscular volume below 74 fL, respectively, or serum iron below 9µmol/l and TIBC more than 50µmol/l. Results: Iron deficiency prevalence was 27,3 percent and iron deficiency anemia prevalence were 24,2 percent. Less than 3000 grams at birth was the most significant risk factor for iron insufficiency (P<0.0001). There's great variation between affected male (IDA n=24; 75%), (ID n=16; 44.4%) and female (IDA n=8; 25%), (ID n=20; 55%), (pv<0.0001). Large numbers of mothers had low educational levels. Most nature babies were at high risk of ID. More than sixty percent of the anemic cases are under the 10th centile of their wt/age. Also, large percentages of iron-deficient infants and anemia had a history of previous hospitalization, 20 cases (55.5%), and 12case (37.5%) respectively. (PV 0.0001). Conclusion: Iron deficiency anemia is prevalent among babies aged 6–12 months in Baghdad. The most significant risk factor for iron deficiency was birth weight below 3000g. sex, mother's education, delay add fortified diet, and previous hospitalization.

Keywords---risk factors, iron-deficiency anemia, infants, Baghdad.

Introduction

Anemia is defined as a hemoglobin concentration that is at least two standard deviations below the mean reference value for healthy persons of the same age and gender. In different age groups, WHO hemoglobin standards are used to define anemia. (1) Despite increased breastfeeding rates, improvements in public health, and the development of iron-fortified foods, the prevalence of anemia and iron deficiency anemia (IDA) remains high in late infancy and early childhood (2,3). 23 percent of infants aged 8 months and 18 percent of infants aged 12 months were anemic. The prevalence of non-anemic iron deficiency in toddlers from rich countries is as high as 30 percent (4).

Iron deficiency is the most common dietary deficit and leading cause of anemia in children less than five, affecting up to 43% of all children under the age of five. The World Health Organization (WHO) considers IDA to be a public health hazard when prevalence rates approach 5% (5). Iron deficiency (ID) but also iron deficiency anemia (IDA) continues to be a global issue. Iron deficiency is the most frequent single nutrient deficiency among children in underdeveloped countries (6). In addition, In the developing hippocampus, iron deficiency modifies the neurochemical profile associated with cognitive performance (7).

Infancy iron insufficiency is linked to delayed mental also motor development, particularly in linguistic ability, body balance, and coordination skills (8Infants aged 6 to 12 months are more susceptible to anemia owing to their quick development and growth, as well as the chance that their mother's iron stores are insufficient. It is essential to supply supplemental nutrients throughout this period. Complementary meals affect the overall nutritional condition of infants. Infants who are solely breastfed have an increased risk of iron deficiency later in life (9).

Patients and methods

A hospital-based investigation was conducted at the primary pediatric teaching hospital. in Baghdad, in period from 1st March 2020 to 1slfebraury 2021. Children between 6 & 12 months of age who were hospitalized provided the samples. A questionnaire was prepared for direct interviewing of the mothers. The questionnaire consisted of fifteen questions including living circumstances, mother's education, previous illnesses, and infant feeding practices. The weight all cases was determined and plotted on age, sex specific charts. (133 case) were involved in the study. The vein was pricked once to collect blood samples. On the Coulter Counter, hemoglobin (Hb) also mean corpuscular volume (MCV) were measured. The serum ferritin concentration was determined using a solid-phase method, ELFA (MINI VIDAS), iron and TIBC, analyzed by COLORI METRIC METHOD. All examinations were analyzed in a laboratory of CENTRAL TEACHING HOSPITAL OF PEDIATRIC. The criteria for IDA were Hb <10.5 g/dL, ferritin<12 µg/L also MCV<74 fL, then for ID ferritin<12 µg/L and MCV<74 fL, or serum iron<9µmol/l and TIC>50µmol /l. Infants with ferritin, MCV, or both levels over

these cutoffs were deemed iron-sufficient. In previous investigations, the cutoff values for Hb (105 g/L) and MCV (74 fL) were used. These values are regarded suitable for this age group. The result for serum ferritin (12µg/L) was determined using WHO standards. Infants were divided into four categories: Iron-sufficient and not anemic (group 1), iron-sufficient and anemic (group 2), iron-deficient and anemic (group 3), and iron-deficient and not anemic (group 4).

Results

In the final analysis, 132 babies were included in total. The control group consisted of 52 newborns (39.4 percent) with Hb also either ferritin or MCV or both over the cutoffs (group 1). twelve infants (9.1%) had anemia without ID (group 2); 32infants (24.2%) had IDA (group 3). Thirty-six infants (27.3%) had ID without anemia (group 4), as shown in figure- 1.

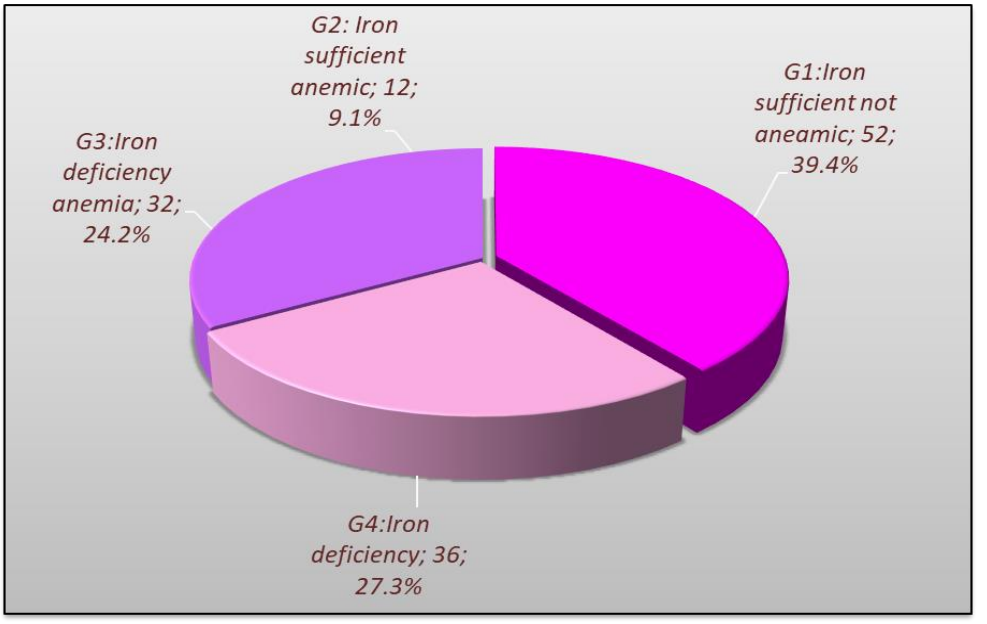

Figure (1): prevalence of IDA and ID in 133 infants

The peak age frequency of IDA in this study is 7month, as shown in table (1), So twenty-four and sixteen out of the 72 (75%, 44.4%) boys were iron-deficient anemia and iron-deficient respectively while only 8 (25%) and 20 (55%) of the 64 girls had IDA and ID (pv<0.0001*). Socioeconomic factors include the mother's degree of education, and living in urban or rural areas, have an effect on iron status (Table -1).

Table (1): Different factors associated with the risk of iron deficiency (n=133)

Age (months)	Iron deficiency anemia		Iron deficiency		Iron sufficient anemic		Iron sufficient not anemic		P-Value
	No	%	No	%	No	%	No	%	
6	8	25.0	8	22.2	8	66.7	12	23.1	0.0001*

7	16	50.0	4	11.1	-	-	16	30.8	
8	-	-	-	-	-	-	8	15.4	
9	4	12.5	12	33.3	4	33.3	12	23.1	
10	-	-	-	-	-	-	4	7.7	
11	4	12.5	8	22.2	-	-	-	-	
12	-	-	4	11.1	-	-	-	-	
Age (months)	7.50±1.61	6-11	8.89±2.11	6-12	7.00±1.4	6-9	7.62±1.29	6-10	0.0001*
Sex Boy	24	75.0	16	44.4	12	100.0	20	38.5	0.0001*
Girl	8	25.0	20	55.6	-	-	32	61.5	
Residence rural	16	50.0	20	55.6	-	-	32	61.5	0.002*
urban	16	50.0	16	44.4	12	100.0	20	38.5	
Mother education Illiterate	16	50.0	20	55.6	12	100.0	16	30.8	0.0001*
Primary	8	25.0	12	33.3	-	-	28	53.8	
Secondary & higher	8	25.0	4	11.1	-	-	8	15.4	

Four of the 133 children were delivered prematurely at 36 weeks (n=3), and 37 (n=1) All participants had weeks of gestation in which the birth weight (BW) exceeds 2000 g. IDA during pregnancy is a high risk for IDA, ID as shown in table-2.

Table (2): The perinatal factor associated with risk for iron-deficiency anemia in infants

Risk factor	Iron deficiency anemia		Iron deficiency		Sufficient anemic		Sufficient not anemic		P value
	No	%	No	%	No	%	No	%	
Anemia during pregnancy Yes	20	62.5	12	33.3	8	66.7	20	38.5	0.028*
No	12	37.5	24	66.7	4	33.3	32	61.5	
Gestational age Preterm	-	-	4	11.1	-	-	-	-	0.012*
Term	32	100.0	32	88.9	12	100.0	52	100.0	
Birth weight <3 Kg	16	50.0	12	33.3	4	33.3	4	7.7	0.0001*
>3 Kg	16	50.0	24	66.7	8	66.7	48	92.3	

The mean BW was substantially lower in the iron-deficient group compared to the iron-sufficient group (6.81±1.16, 8.22±2.38) vs. (7.85±1.00) kg; (P<0.0001*). (Table-3)

Table (3): The mean of body weight in IDA and ID groups

Weight (Kg)	Iron deficiency anemia	Iron deficiency	Iron sufficient anemic	Iron sufficient not anemic	P-value

	No	%	No	%	No	%	No	%	
4	-	-	4	11.1	-	-	-	-	0.0001*
5	4	12.5	4	11.1	4	33.3	-	-	
6	16	50.0	4	11.1	4	33.3	4	7.7	
7	4	12.5	-	-	-	-	20	38.5	
8	4	12.5	12	33.3	4	33.3	20	38.5	
9	4	12.5	-	-	-	-	4	7.7	
10	-	-	4	11.1	-	-	4	7.7	
11	-	-	8	22.2	-	-	-	-	
Weight (Kg)	6.81±1.16	5.5-9.0	8.22±2.38	4.5-12.0	6.33±1.30	5.0-8.0	7.85±1.00	6.0-10.0	0.0001*

Discussion

In a central teaching hospital in Baghdad, this is a hospital-based descriptive epidemiological study to determine the prevalence also etiology of ID also IDA. The prevalence of ID then IDA in babies aged 6–12 months was 27.3 percent also 24.2 percent, respectively, according to this study, which is alarmingly high. Anemia due to iron deficiency is becoming less common in the United States, affecting people of all ages and genders (10). as well as in Scandinavian Many countries have devised nutrition-specific and/or nutrition-sensitive initiatives to boost individuals' iron intake also absorption because both ID then iron deficiency anemia (IDA) have substantial health effects (11).

Due to decreased iron stores at delivery compared to term infants, rapid growth, and iron losses, preterm newborns are more likely to develop iron deficiency anemia (IDA) in the first four months of life. During the third trimester of pregnancy, the majority of fetal iron is transmitted from the mother. Preterm birth interrupts this process, resulting in iron reserves proportionate to birth weight at birth. Despite low iron stocks at birth, premature newborns' growth velocity peaks at 28–38 weeks postmenstrual age, indicating a high iron requirement. Frequent uncompensated iatrogenic phlebotomy losses raise the risk of IDA in preterm newborns (12,13,14)

One cause for the high frequency of IDA in Baghdad could be that iron-fortified food is not widely available in the city. The lack of a direct program for IDA prevention in babies could be the second cause. The findings of this study suggest that IDA prevention programs could be beneficial, particularly in hospitalized infants or in primary health care settings. In Denmark, The direct IDA prevention campaign has been authorized. ID and IDA were almost non-existent in Danish newborns nine months old (15). However, given the high prevalence of ID and IDA in Baghdad, it's possible that the criteria standard for ID (ferritin 12 g/L, MCV 74 fL) then anemia (Hb 105 g/L) was too high. Ferritin levels should be lower than 11 g/L and MCV71 fL or s. iron 9 g/l plus TIBC>50 g/l for diagnosis of ID, according to the current study. Reference values for iron status variables in babies are not well characterized. Hb 110 g/L is a commonly used cut-off value in clinical practice and research for detecting ID and IDA in children aged 6–12 months (16).

The prevalence of iron-deficiency anemia was 39.4% in this study. Infection is the second most prevalent cause of anemia in children this age. The frequency of respiratory diseases was much higher in Estonian and Swedish children during their first two years of life, which could explain why the incidence of iron-deficiency anemia was so high in this age group.

Cases from rural areas were more affected than those from metropolitan areas in this study. This could be attributed to longer nursing or a strong link between a child's health and his or her parents' educational level (17). Higher maternal education has been linked to increased understanding of health and nutrition, as well as an improvement in the nutritional content of children's diets (18).

Infants with a BW of less than 3000 g had a higher chance of acquiring ID in the current study. The majority of infants born small for gestational age (SGA) gain weight and length throughout the 1st 2 years of life. As a result, During this phase of rapid economic progress, the rising demand for iron may result in ID. A link between low BW & ID in babies was also discovered. As a result, newborns with low BW may require IDA primary prophylaxis. Gender appears to play a role in an infant's iron status, as several studies around the world have found similar sex disparities (19,20).

The frequency of anemia is high in the country's rural areas can also be attributed to: a) malnutrition as a result of limited consumption of foods rich in micronutrients as a result of poverty also a less favorable socioeconomic status; and b) a lack of safe drinking water also better sanitation facilities, which leads to higher rates of infections also diseases, and thus an increased risk of anemia (21), As a result, socioeconomic factors such as the infant's birth order, the mother's educational level, and the introduction of solid food had no effect on iron status. Vendt et alfin dings. also revealed that there was no link between iron status and the mother's age, educational level, introduction to solid food, or residing in an urban or rural location (22).

Conclusion

In babies aged 6 to 12 months, iron deficiency and iron-deficiency anemia are prevalent. Special consideration must be given to newborns with a birth weight of less than 3000 g who are at a High likelihood of iron deficiency, as well as those with a history of gastroenteritis or chest infection.

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