

The relation between feeding patterns and iron-deficiency anemia in infants

By

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Abstract:

Background: Despite the fact that iron deficiency anemia has been less widespread in recent years, it remains the most common nutrient shortage worldwide. **Objective:** To investigate the relation between newborn feeding habits and iron deficiency anemia. **Patients and method:** This study is a hospitalized-based study performed in a central teaching hospital in Baghdad, from 1st March 2020 to 1st February 2021, to determine the prevalence and causes of IDA in infants between six months and 12m of age. Full history was taken from the mothers, and an assessment of nutritional status was done to all cases. Mean corpuscular volume and hemoglobin, serum ferritin, serum iron, and total iron-binding capacity were measured in (n=133) infants. Anemia was defined when hemoglobin level was lower than 10.5 g/L, and serum ferritin below 12 μg/l, iron deficiency when ferritin level and mean corpuscular volume were lower than 12 μg/L and 74 fL, respectively, or serum iron below 9 μmol/l and TIBC more than 50 μmol/. **Results:** Current study showed that 28 (21%) of the 133 infants were exclusively breastfed up to 6 months and 24 (18.8%) of the 133 were partly breastfed, i.e. were fed with breast milk and solid food at the time of the study. Also, infants who were exclusively breastfed until the age of 6 months had significantly lower s.iron (7.49±6.13) and ferritin (77.71±.07) and infants who were breastfed with added solid food, (7.95±6.53), (21.37±31.37). Most of the cases of IDA have a past history of the previous hospitalization due to chest infection and gastroenteritis, also this study shows there's a significant decrement in risk of ID. An infant who gave iron and vit. Supplementation. **Conclusion:** In infants aged 6–12 months, iron insufficiency and iron deficiency anemia are prevalent. In addition, the current study found that infants who were exclusively breastfed for up to 6 months outperformed those who were partly breastfed at the time of the study, i.e. were fed breast milk plus solid food. Infants who were exclusively breastfed until they were 6 months old had considerably lower S.iron and ferritin levels than those who were nursed with solid food. The majority of IDA cases have a history of previous hospitalization for chest infection or gastroenteritis, and this study found a significant reduction in the risk of ID. Iron and vitamin supplementation was given to a newborn.

Keywords: feeding patterns; iron-deficiency anemia; infants

Introduction:

Despite its serious health and social consequences, anemia is still a major public health concern, and it has been identified as one of the leading causes of infant mortality and morbidity in developing countries (1). Iron deficiency is the most common nutritional deficiency and cause of anemia worldwide, affecting up to 43% of all children under the age of 5 years (2).

Iron deficiency is the most common childhood nutritional problem worldwide, and it can be caused by a low-iron diet, poor intestinal iron absorption, or parasite infections (3). Iron-containing formulae should be given to non-breastfed infants, with increased iron formulations for high-risk groups. Cow's milk evaporated milk, and other types of milk should be avoided until after 12 months of age since they do not provide absorbable nutrients and may reduce the consumption of other nutrient-dense foods (4). Several studies have linked a higher intake of cow's milk to a higher risk of iron insufficiency (5). It's also a good idea to stop bottle-feeding because it helps to restrict milk intake (6). All other treatments are explored if IDA persists and blood is seen in the stool. If IDA persists and a blood test in the stool is positive, all milk products should be discontinued. The child should have enough calcium in his or her diet in these instances (calcium-rich foods).

Patients and methods:

From March 1, 2020, to January 1, 2021, a hospitalized-based study was conducted at Baghdad's leading teaching hospital for pediatrics. The children in the study ranged in age from 6 months to 12 months and were admitted to the hospital.

For direct interviewing of the mothers, a questionnaire was devised. The questionnaire asked 15 questions regarding the baby's eating habits, housing conditions, mother's education, and previous diseases. All of the patients' weights were calculated and placed on age and gender-specific charts. The study included a total of 133 cases. By poking the vein once, blood samples were taken. On the Coulter

Counter, hemoglobin (Hb) and mean corpuscular volume (MCV) were measured. COLORI METRIC METHOD was used to assess serum ferritin concentrations utilizing a solid-phase, ELFA (MINI VIDAS),s.iron, and TIBC. The results of all tests were examined at the CENTRAL TEACHING HOSPITAL OF PEDIATRIC's laboratory.

Hb 10.5 g/dL, ferritin 12 g/L, and MCV74 fL were used for IDA, and ferritin 12 g/L, MCV74 fL, or serum iron 9 mol/l, and TIC>50 mol/l were used for ID. Iron-sufficient infants had ferritin or MCV levels that were above these cutoff values, or both. In previous investigations, the cutoff values for Hb (105 g/L) and MCV (74 fL) were employed, These values have been determined to be suitable for this age group. According to WHO guidelines, the value for serum ferritin (12 g/L) was used. The infants were divided into four groups: group 1: iron-sufficient but not anemic; group 2: iron-sufficient but anemic group 3: iron-deficient but not anemic and group 4: iron-deficient but not anemic group 4).

Results:

A total of 132 infants were included in the final analysis. There were 52infants (39.4%) with Hb and either ferritin or MCV or both above the cutoff points composing the control group (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).

This study shows that 28 (21%) of the 133 infants were exclusively breastfed up to 6 months and 24 (18.8%) of the 133 were partly breastfed, i.e. were fed with breast milk and solid food at the time of the study (Table-1).

Table(1): The relation between feeding habits and iron deficiency.

| Type of feeding | Iron deficiency anemia | | Iron deficiency | | Iron sufficient anemic | | Iron sufficient not anemic | | P-value |
|----------------------------|------------------------|------|-----------------|------|------------------------|------|----------------------------|------|---------|
| | No | % | No | % | No | % | No | % | |
| Breast feeding | 12 | 37.5 | 8 | 22.2 | 4 | 33.3 | 4 | 7.7 | 0.0001* |
| Breast feeding +solid food | 8 | 25.0 | 12 | 33.3 | 4 | 33.3 | - | - | |
| Formula | 8 | 25.0 | 8 | 22.2 | - | - | 28 | 53.8 | |
| Formula +solid food | 4 | 12.5 | 8 | 22.2 | 4 | 33.3 | 20 | 38.5 | |

Infants who were exclusively breastfed until the age of 6 months had significantly lower S.iron (7.49 ± 6.13) and ferritin (77.71 ± 0.07) and infants who were breastfed with added solid food, (7.95 ± 6.53), (21.37 ± 31.37). (Table-2).

Table (2): The relation between feeding habits and Serum iron, Serum ferritin

| Type of feeding | Serum iron | Serum ferritin |
|----------------------------|-------------|----------------|
| | Mean± SD | Mean± SD |
| Breast feeding | 7.49±6.13 | 77.71± .07 |
| Breast feeding +solid food | 7.95±6.53 | 21.37±31.37 |
| Formula | 19.99±15.34 | 87.19±73.05 |
| Formula+ solid food | 13.77±7.84 | 98.99±125.81 |
| P value | 0.0001* | 0.035* |

*Significant using ANOVA test at 0.05 level of significance

Most of the cases of IDA have a past history other f previous hospitalization due to chest infection and gastroenteritis, also this study shows there's a significant decrement in risk of ID. In an infant who gave iron and vit. supplementation (Table-3)

Table (3): The effect of iron and vit. Supplementation on ID and the risk of the previous admission.

| | Iron deficiency anemia | | Iron deficiency | | Iron sufficient anemic | | Iron sufficient not anemic | | P-value |
|---------------------|------------------------|------|-----------------|------|------------------------|-------|----------------------------|------|---------|
| | No | % | No | % | No | % | No | % | |
| Vitamins suppl. Yes | 8 | 25.0 | 12 | 33.3 | - | - | 20 | 38.5 | 0.059 |
| No | 24 | 75.0 | 24 | 66.7 | 12 | 100.0 | 32 | 61.5 | |
| Iron suppl. Yes | 4 | 12.5 | 8 | 22.2 | - | - | 8 | 15.4 | 0.293 |

| | | | | | | | | | |
|------------------------|----|------|----|------|----|-------|----|------|--------|
| No | 28 | 87.5 | 28 | 77.8 | 12 | 100.0 | 44 | 84.6 | |
| Previous admission Yes | 12 | 37.5 | 20 | 55.6 | 8 | 66.7 | 8 | 15.4 | 0.0001 |
| No | 20 | 62.5 | 16 | 44.4 | 4 | 33.3 | 44 | 84.6 | * |

Table (4): The weight percentile distribution

| Percentile | Iron deficiency anemia | Iron deficiency | Iron sufficient anemic | Iron sufficient not anemic |
|------------|------------------------|-----------------|------------------------|----------------------------|
| <5th | 28.1% | 25.0% | 33.3% | - |
| 5-10th | 34.4 | 11.1 | 33.3 | 21.2 |
| 10--50th | 28.1 | 25.0 | 25.0 | 42.3 |
| 50th-- | 9.4 | 38.9 | 8.3 | 36.5 |

Discussion

This study shows that 28 (21%) of the 133 infants were exclusively breastfed up to 6 months and 24 (18.8%) of the 133 were partly breastfed, i.e. were fed with breast milk and solid food at the time of the study, Infants who were exclusively breastfed until the age of 6 months had significantly lower S.iron (7.49 ± 6.13) and ferritin (77.71 ± 0.07) and infants who were breastfed with added solid food, (7.95 ± 6.53), (21.37 ± 31.37).

Results of the current study show that exclusive breastfeeding for five to six months has a larger protective effect against the development of nutritional and iron-deficiency anemia in Jordan than in a shorter period of four months. Around 29% of Jordanian newborns who had been exclusively breastfed for four months had iron deficiency at six months of age, compared to none of the infants who had been solely nursed for five

or six months. The bioavailability of iron in breastmilk is high, ranging from 50 to 70%. (7).

Differences in sampling methodology and lactation stage may contribute to the wide range of breast milk iron values reported in the literature. The iron concentration of human milk is highest in early transitional milk (0.97 mg/ml), but it steadily drops during lactation, reaching a level of roughly 0.35 mg/ml at 1 month of lactation and then down to 0.20 mg/ml at the end of lactation. 6-month period (8). Most of the cases of IDA have a past history other f previous hospitalization due to chest infection and gastroenteritis, also this study shows there's a significant decrement in risk of ID. In an infant who gave iron and vit. supplementation.

The fact that Hb's major role is to permit oxygen and carbon dioxide transfer, as well as to deliver and inactivate nitric oxide and act as a buffer, could explain why this study showed a strong correlation between anemia and the severity of respiratory distress as a symptom of LRTI. Hemoglobin's primary role in the blood is to maintain a constant oxygen pressure in the tissues. As a result, a drop in Hb, either quantitatively or qualitatively, may impair normal activities. Low Hb levels, which have been recognized as a serious risk factor for ALRTI, could be the result of this(9), At the end of the supplementing phase at 6 months of age, Friel et al.,2003 discovered that iron had a substantial influence on hemoglobin but not on PF. In contrast to the current study, at 6 months, 33 percent of infants getting a placebo and 7% of infants receiving iron were iron deficient (PF 12 g/L); 14 percent of infants receiving a placebo had IDA(10).

Conclusion:

In infants aged 6–12 months, iron insufficiency and iron deficiency anemia are prevalent. In addition, the current study found that infants who were exclusively breastfed for up to 6 months outperformed those who were partly breastfed at the time of the study, i.e. were fed breast milk plus solid food.

Infants who were exclusively breastfed until they were 6 months old had considerably lower S.iron and ferritin levels than those who were nursed with solid food. The majority of IDA cases have a history of previous hospitalization for chest infection or gastroenteritis, and this study found a significant reduction in the risk of ID. Iron and vitamin supplementation was given to a newborn.

References:

- 1) Brabin BJ, Premji Z, Verhoeff F: An analysis of anemia and child mortality. *J Nutr.* 2001, 131 (2): 636S-648S.
- 2) WHO guideline on the use of ferritin concentrations to assess iron status in individuals and populations, <https://apps.who.int/iris/bitstream/handle/10665/331505/9789240000124-eng.pdf> (2020), Accessed 30th Apr 2021
- 3) WHO. Iron Deficiency Anaemia: Assessment, Prevention, and Control a Guide for Programme Managers. Geneva, Switzerland:WHO; 2001.
- 4) Sharon L. Unger, Tanis R. Fenton, Radha Jetty, Jeff N. Critch, Deborah L. O'Connor; Canadian Paediatric Society, Nutrition and Gastroenterology Committee Paediatr child health .2019, 24(8):555.
- 5) Gupta PM, Perrine CG, Mei Z, Scanlon KS. Iron, anemia, and iron deficiency anemia among young children in the United States. *Nutrients.* 2016;8:330. DOI: 10.3390/nu8060330
- 6) Brotanek JM, Halterman JS, Auinger P, et al. Iron deficiency, prolonged bottle-feeding, and racial/ethnic disparities in young children. *Archives of Pediatrics & Adolescent Medicine.* 2005;159:1038-1042
- 7) Saarinen U, Siimes M. Iron absorption in infants: high bioavailability of breast milk iron as indicated by the extrinsic tag method of iron absorption and by the concentration of serum ferritin. *J Pediatr* 1977;90:375–9.

- 8) Shashiraj , Faridi MMA, Singh O, Rusia U: Mother's iron status, breast milk iron and lactoferrin- are they related?. *Eur J Clin Nutr.* 2006, 60: 903-908. 10.1038/sj.ejcn.1602398.
- 9) Ganong WF. *Gas transport between the lungs and tissues. Review of medical physiology.* 22nd ed. New York, NY: Mc Graw-Hill; 2005. pp. 666–669
Shashiraj, Faridi MMA, Singh O, Rusia U: Mother's iron status, breast milk iron and lactoferrin- are they related? *Eur J Clin Nutr* 2006, 60:903-908.
- 10) Friel JK, Aziz K, Andrews WL, Harding SV, Courage ML, Adams RJ. A double-blind, randomized control trial of iron supplementation in early infancy in healthy term breast-fed infants. *J Pediatr* 2003;143:582–6.