

PREVALENCE OF IRON DEFICIENCY AND IRON DEFICIENCY ANAEMIA IN 2-5 YEARS OLD CHILDREN

By

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Abbreviations

T.S.I.: total serum iron
T.I.B.C.: total iron binding capacity
Hb: hemoglobin
I.D.: iron deficiency
I.D.A.: iron deficiency anaemia
M: male
F: female

Summary

In this screening study, 100 child were involved taken randomly of both sexes 58 males and 42 females aging 2-5 years. They are submitted to investigations of Hb, TSI and TIBC.

38 child (38%) showed decreased TSI with normal Hb and TIBC from whom 24 cases are males and 14 are females.

32 child (32%) showed result of IDA (i.e decrease TSI, increase TIBC and decrease Hb) from whom 16 cases are males 16 are females.

The rest (30 cases) showed normal results (i.e normal Hb, TSI and TIBC) 18 are males and 12 are females.

الخلاصة

100 طفل شملوا بهذه الدراسة من مراجعي العيادة الاستشارية للأطفال في مستشفى الولادة والأطفال في النجف، أخذوا كعينات عشوائية من الجنسين (58) ذكور و (42) إناث تتراوح أعمارهم بين 2-5 سنوات للفترة من كانون الثاني/ 2000 ولغاية تموز/ 2000. أخذت عينات من الدم لفحص نسبة خضاب الدم ، نسبة الحديد الكلية في الدم وسعة اتحاد الحديد الكلية في الدم .

38 طفل (38%) لوحظ لديهم قلة في نسبة الحديد في الدم فقط منهم (24) ذكر و(14) أنثى .
32 طفل (32%) ظهرت لديهم نتائج فقر دم نقص الحديد (نقص في نسبة الحديد في الدم، زيادة سعة اتحاد الحديد الكلية في الدم ونقص نسبة خضاب الدم) منهم (16) ذكر و(16) أنثى .
بقية الأطفال (30) ظهرت نتائجهم طبيعية منهم (18) ذكر و (12) أنثى.

Introduction

Iron is one of the essential constituents of the body. Most of iron contained in haemoglobin (70%) and up to 25% of iron stores mainly in liver, spleen and bone marrow. 5-10% is contained in other haemproteins. About 0.1% of total body iron is present in plasma ⁽¹⁾. The body of newborn infant contains about 0.5 g of iron, whereas the adult content is estimated at 5 g. To make up for this discrepancy an

average of 0.8 mg iron must be absorbed each day during the first 15 years of life. Because absorption of dietary iron is assumed to be about 10%, a diet containing 8-10 mg of iron daily is necessary for optimal nutrition ⁽²⁾. Foods rich in iron include organ meats (Liver, Heart) muscle meat, fish, egg yolk, fruit, dried beans and green vegetable ⁽³⁾.

Iron absorption, transport, storage and utilization:

Most of iron is absorbed in the upper part of the small intestine. The duodenum and adjacent jejunum contain most of iron suitable for absorption ⁽⁴⁾.

Iron is more readily absorbed in ferrous state (Fe^{2+}). It absorbed from brush border, then transfer to mobilferrin, which transfer it in to the cell. In plasma, iron transported by a polypeptide protein called transferrin, which transport the iron to the developing red cells in bone marrow. Normally its iron-binding sites are about 30% saturated. Apoferritin combine with iron to form ferritin, which is the principal storage form of iron in tissue ⁽⁵⁾.

Factors affect the absorption of iron:

A. The chemical state of iron

Iron in ferrous state is more readily absorbed than ferric state. The iron in haem can be absorbed while still contained in haem molecule. ⁽⁶⁾

B. Complex formation

Vitamin C forms a soluble complex and thus facilitates absorption. Phytate inhibit absorption by forming insoluble complexes. ⁽⁶⁾

C. State of iron stores

Iron absorption increased when body stores are depleted or when erythropoiesis increases. ⁽⁷⁾

Anaemia resulting from lack of sufficient iron for synthesis of Hb is the most common hematological disease of infancy and childhood. Infant breast fed exclusively should receive iron supplementation from 4 months of age, because anaemia solely by in-adequate dietary iron becomes common at 9-24 months of age. ⁽⁸⁾

Etiology of iron deficiency anaemia: ⁽⁹⁾

A. Decreased in neonatal haemoglobin masses in low birth weight and significant prenatal hemorrhage.

B. Consumption of large amounts of milk and of carbohydrates unsupplemented with iron.

C. Blood loss must be considered particularly in older child, which may be due to peptic ulcer, Meckel's diverticulum, polyp or hemangioma.

D. Hook worms infestation in some geographic area. ⁽⁹⁾

Clinical presentation: ⁽⁹⁾

A. Pallor

B. Irritability and anorexia, tachycardia and cardiac dilatation occur and systolic murmur is often present when Hb level falls below 5 g/dl.

C. Spleen is enlarged in 5-10% .

D. Pica is sometimes prominent.

Treatment: ⁽¹⁰⁾

Oral administration of simple ferrous salts 6 mg/kg/24hr of elemental iron in three divided doses. A parenteral iron preparation is an effective and safe but is no more rapid or complete than oral administration. In most cases the indication is social one. Iron medication should be continued for 4-6 wk after blood values are normal.

Indication of blood transfusion: ⁽⁹⁾

- A. Very severe anaemia.
Hb less than 4 g/dl.
- B. Super imposed infection. ⁽⁹⁾

Indication of prophylaxis:

- A. Per mature
Iron supplementation 2 mg/kg/24hr should be started when infant's birth weight has doubled or treated with erythropoietin. ⁽¹⁰⁾
- B. Pregnant woman:
Iron supplementation should be given daily. ⁽¹¹⁾

Normal values: ⁽¹²⁾

Hb: 10.5-14 g/dl.

TSI: 50-120 μ mg/dl.

TIBC: infant 100-400 μ mg/dl.

Thereafter 250-400 μ mg/dl.

Patient and method:

The study was conducted over 6 months period (1/2000-7/2000) 100 children aged 2-5 yr. attending the child clinic of Al-Najaf maternity and children hospital for variable causes who were not received blood transfusion before, no history of bleeding disorder, no family history of blood disease were submitted to Hb%, TSI, TIBC. All blood samples were taken between 9-12 a.m. and were analyzed at the same day for Hb concentration by cyanomethaemoglobin method and TSI, TIBC by calorimetric method at the hematological and biochemistry department in the hospital laboratory respectively.

The children are consider IDA when Hb<10 g/dl TSI decrease and increase of TIBC above normal range. They considered ID when TSI decreased while Hb and TIBC are within normal range.

Results

ID and IDA is an important problem in pediatric group and specially in our condition regarding the sanction, so we tried a simple local screening study in Al-Najaf society to discover the severity of this problem and the result were:

- A. Regarding the incidence of ID without anaemia we found that 38% ID 24 male and 14 femal as its show in table(1).
- B. Concerning IDA our findings declare that 32% which is mainly seen in 16 male and 16 female and the ratio of male: female is 1:1. these data are seen in table(2).
- C. If we compare our findings with other studies in our country or other countries in the world we see that in our study ID 38% is higher than other studies even in Baghdad (25%), and regarding IDA in our study 32% but in Baghdad its 60% while in other studies its less than 10%, as show in table(3).

Table(1)
Incidence of ID & IDA

Type	ID	IDA	Normal	Total
No.	38	32	30	100
%	38%	32%	30%	100%

Table(2)

Sexual differentiation of ID & IDA

Type	M	%	F	%	M:F	Total	%
ID	24	24%	14	14%	1.7:1	38	38%
IDA	16	16%	16	16%	1:1	32	32%
Normal	18	18%	12	12%	1.5:1	30	30%
Total	58	58%	42	42%	1.1:1	100	100%

Table(3)

Comparison of different studies regarding incidence of ID & IDA

Place	ID	IDA
Australia ⁽¹⁴⁾	19.5%	10%
Spain ⁽¹⁵⁾	5%	1%
Taiwan ⁽¹⁶⁾	35%	10%
Baghdad ⁽¹³⁾	25%	60%
Najaf	38%	32%

Discussion

The finding that cognitive activities of affected children would be slowed due to iron deficiency has led some to advocate for a program for early identification and treatment. ⁽¹⁷⁾

The detection of iron deficiency in a population survey requires the use of a battery of lab in investigation of the iron status ⁽¹⁸⁾. Starting with Hb and mean cell volume (microcytosis), this step should be combined with a third ⁽¹⁹⁾ either (s. ferritin or TS or FEP). In this study it was impossible to assess the s. ferritin (requiring radioummunoassay not available due to the sanction situation), so we contented to look at the s. iron, TIBC and Hb in order to have an idea about the iron status in randomly selected group of Iraqi children.

In our study we found that ID is present in 38% of children with a ratio of male: female 1.7: 1 and the IDA is present in 32% which is equally affecting both sexes.

In a study in Birmingham showed a direct correlation between iron deficiency, physical growth and delayed psychomotor development ⁽²⁰⁾. While iron deficiency may not be the only factor in impaired development it can at least be easily identified and treated. Its important and deserves emphasis, so child health clinics should hunt out and treat iron deficiency, as part of routine child health surveillance ⁽¹⁷⁾.

The size of the sample in our study is somewhat small not enough to assess the actual size of the problem in the Iraqi children, by yet its definitely widely prevalent and its exceeding the figures found in many researches done on variable Australia ⁽¹⁴⁾, Spain ⁽¹⁵⁾, Taiwan ⁽¹⁶⁾ pediatric population in whom iron deficiency affects about 5% up to 35% and IDA affects 1% up to 10%. These higher levels in our society can be explained by the poor socioeconomic states, which is highly deteriorated during the long timed sanction. Lastly if we compare our study with that done in Baghdad ⁽¹³⁾ we found that the ID in Najaf is higher than that in Baghdad while the IDA is lower in our study, this differences can not be fully explained but as a whole this would place our children as a highest risk group calling for every effort to be used for the early detection and treatment of ID, starting from the child welfare clinics by proper orientation of the doctors and by trying to make use of the simple lab procedures

available to detect anaemia (simple hematocrit measurement) which might give a good idea about the Hb level.

Recommendation

1. Because ID & IDA may affect the cognitive function of children, so iron prophylaxis be indicated in 2-5 years old children especially in our circumstances.
2. The study may be followed by a wider using more sophisticated investigations as well as involving all age groups to highlight the problem.
3. Encouragement of the families about early introduction of iron contained foodstuff to their children especially meat & eggs.
4. Education of the families about the danger of ID & IDA utilizing the TV & newspapers.
5. Anemia is common in mothers & their anemia may have an appreciable effect on their well-being & tolerance of their children difficult behavior. It is not enough to treat the child anemia & ignore that of mother.

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