Efficacy of Supplementation in Filipino Children

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Abstract

Introduction: At present, in the absence of an anemia prevention and screening program in Barangay Vasra, this will aid in the formation of programs that would teach about this health related issue, with an intervention that could be used efficiently by the health workers at the non-government organization run center. Objective: The aim of the following study is to establish the efficacy of iron supplementation alone versus iron and ascorbic acid supplementation in improving the hemoglobin (Hgb), hematocrit (Hct), reticulocyte count and red cell indices of anemic undernourished children 5-10 years of age at Lingap Center, Barangay Vasra, Quezon City. Methodology: Anemic undernourished male and female children 5-10 years of age enrolled in the Supplementary Feeding Program of Lingap Center, Barangay Vasra, Quezon City. Study Design: Prospective, experimental trial comparing two interventions-iron supplementation alone versus iron and ascorbic acid supplementation. Results: A total of 25 children participated in this study, with a majority being female at 52% (13/25) of the total. Those who received iron supplementation alone for 6 months, while there were 50% (6/12) of either sex, whereas subjects who took iron and ascorbic acid supplementation for 6 months were predominantly female at 53.85% (7/13). Data obtained before and after iron supplementation alone revealed that there was an increase among the levels of Hgb, Hct, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and reticulocyte count, with the rise statistically significant. Hematological values gained before and after iron and ascorbic acid supplementation uncovered that there was an augmentation among the levels of Hct, MCV, MCH, MCHC and reticulocyte count, with the improvement statistically significant. Encompassing both interventions, the differences in findings were statistically significant in red blood cell (RBC) count, with the level progression statistically significant. Conclusion: Overall, the results were statistically significant in terms of RBC count alone. Therefore, this study demonstrated that compliance with intake of supplementation is a factor in improving the hematological parameters of these subjects. To address iron deficiency anemia, a similar endeavor may establish a system of support in Lingap Center to ensure the screening and therapeutic management of this population.

Keywords: Ascorbic acid, children, iron, Philippines, supplementation

Introduction

When global anemia prevalence is examined for each physiological group, using the World Health Organization global database on anemia, the most affected groups are pregnant women (48%) and 5-14-year-old children (46%). Pre-school children (39%) are also a high-risk group.

Statement of the problem

This research seeks to answer the following question:

What is the efficacy of iron supplementation alone versus iron and ascorbic acid supplementation in improving the hematological parameters of undernourished children in Quezon city?

Objectives

General objective

To establish the efficacy of iron alone versus iron and ascorbic acid supplementation in improving the hematological parameters of undernourished in Quezon City.

Specific objectives

1. To compare the values before and after iron supplementation alone among undernourished children, in terms of hematological parameters
2. To compare the values before and after iron and ascorbic acid supplementation among undernourished children in terms of hematological parameters.

Review of Related Literature

In the latest national nutrition survey conducted by the Department of Science and Technology and the Food and Development Institute, anemia was found to be a significant health issue in the Philippines. This study aims to address this issue by evaluating the efficacy of iron and ascorbic acid supplementation in improving hematological parameters in undernourished children.

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Nutritional Research Institute revealed that there was no improvement in anemia in the Philippines, especially in infants 6 months to less than 1 year of age. The prevalence of anemia among these subjects is as high as 66%. In 1-year-old children, it was computed to be 53%. These numbers confer that iron deficiency anemia may still be a staid health issue, particularly in children. This is a consequence of the body’s inability to manufacture an adequate number of healthy red blood cells (RBCs) and a lack in iron. Minimal, but chronic, blood losses, secondary to parasite infestation, like that which occurs in hookworm infection, also result in anemia. Poor dietary intake of iron is a common cause of this type of anemia in children. In an experimental trial accomplished in children aged 6 until 13 years old in the Philippines, the subjects were assigned to two groups—those receiving vitamin A-fortified pandesal, fortified with 133 g retinol equivalents versus, versus an ordinary, non-fortified pandesal 5 days/week for 30 weeks. Results showed the regular intake of vitamin A-fortified pandesal enhanced the vitamin A status of children with marginal to low initial serum retinol concentrations.

Hemoglobin (Hgb) levels increased significantly in pre-school children who were provided weekly iron supplementation, regardless whether or not these subjects underwent de-worming. There was a decrease in anemia prevalence and there was a significant improvement in Hgb levels.

Growth status of children 3-5 years of age, belonging to the same environmental and socio-economic conditions, was studied in India. Anemic children had statistically inferior body weight, height and weight for age. When these subjects were given ferrous supplementation at 40 mg of elemental iron/day for 6 months, there was a significant improvement in Hgb levels. Another study in Indonesia classified anemic and non-anemic children, based on baseline Hgb and transferring levels and received either iron or placebo treatments, respectively, for 12 weeks. The administration of 10 mg of ferrous sulfate per kilogram of body weight for 3 months resulted in a significant progress in hematological levels and growth. Another study in Indonesia studied the effects of iron supplementation on children with low weight-for-age. The group who received daily supplementation composed of 30 mg of elemental iron and vitamin C showed a significant rise in hematological values.

Methodology

Study design

This will be a two-arm prospective analysis comparing the values hematological parameters of undernourished children, 5-10 years of age in Quezon City, before and after iron alone versus iron and ascorbic acid supplementation.

Sample population

Inclusion criteria
a. Children, male and female
b. Age 5-10 years old

c. Parent or caregiver identified as a resident of Barangay Vasra, project 6, Quezon city, at least 1 month prior to the date of enrollment, provided with informed assent [Appendices A and B].
d. Neither chronic medical problems nor regular medications being taken by a specialist.

Exclusion criteria
a. Current nutritional status below the 5th percentile or above the 95th percentile requiring critical care
b. Known hypersensitivity to iron
c. Known hypersensitivity to ascorbic acid
d. Severe diseased of the liver or cardiovascular system
e. Serious infection
f. Significant blood loss
g. Bleeding disorders
h. Asthma
i. Hemoglobinopathy.

Research setting

Lingap Center shall be established as the site of this study, based on its current population of 29 undernourished children, 10 years of age and the Family Medicine resident’s community rotation at Unang Lingap Center, in close proximity to the location of Veterans Memorial Medical Center.

Statistical analysis

The values of Hgb (in g/dL), hematocrit (Hct) (mg%), RBC count (×10^6), mean corpuscular volume (MCV) (fL), mean corpuscular hemoglobin (MCH) (pg), mean corpuscular hemoglobin concentration (MCHC) (g/dL) and reticulocyte count (%) were evaluated for significant changes pre- and post-intervention within the respective groups using the paired t-test. Levels were then compared before iron supplementation alone versus iron and ascorbic acid supplementation, respectively, utilizing the independent t-test.

Results

A total of 25 children were participated in this study, with a majority being female at 52% (12/25) of the total. Those who received iron supplementation alone for 6 months, while there were 50% (6/12) of either sex, while subjects who took iron and
**Table 2:** Comparison of levels of Hgb (in g/dL), Hct (mg%), RBC (×10^{12}), MCV (fL), MCH (pg), MCHC (g/dL) and reticulocyte count (%) before and after iron supplementation alone among undernourished children 5-10 years of age at Unang Lingap Center, Barangay Vasra, Quezon city

| Laboratory parameters | Hgb (g/dL) | Hct (mg%) | RBC (×10^{12}) | MCV (fL) | MCH (pg) | MCHC (g/dL) | Reticulocyte count (%) |
|-----------------------|------------|-----------|----------------|----------|----------|------------|-----------------------|
| Iron supplementation alone (N=12) | | | | | | | |
| Pre-treatment, mean±SD | 12.67±0.66 | 0.39±0.02 | 4.56±0.38 | 86.16±3.89 | 27.83±1.31 | 32.24±0.75 | 10.58±1.24 |
| Post-treatment, mean±SD | 13.35±0.12 | 0.44±0.01 | 4.54±0.05 | 96.63±0.35 | 29.41±0.25 | 30.43±0.30 | 40.58±10.25 |
| P value*, Paired t test | 0.005 | 0 | 0.812 | 0.003 | 0 | 0 | 0.00 |

*P<0.05 means significant; SD: Standard deviation; Hgb: Hemoglobin; Hct: Hematocrit; RBC: Red blood cell count; MCV: Mean corpuscular volume; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration

**Table 3:** Comparison of levels of Hgb (in g/dL), Hct (mg%), RBC (×10^{12}), MCV (fL), MCH (pg), MCHC (g/dL) and reticulocyte count (%) before and after iron and ascorbic acid supplementation among undernourished children 5-10 years of age at Unang Lingap center, Barangay Vasra, Quezon city

| Laboratory parameters | Hgb (g/dL) | Hct (mg%) | RBC (×10^{12}) | MCV (fL) | MCH (pg) | MCHC (g/dL) | Reticulocyte count (%) |
|-----------------------|------------|-----------|----------------|----------|----------|------------|-----------------------|
| Iron and ascorbic acid supplementation (N=13) | | | | | | | |
| Pre-treatment, mean±SD | 12.79±0.94 | 0.39±0.03 | 4.63±0.34 | 85.28±3.07 | 27.66±1.47 | 32.42±0.87 | 10.38±1.19 |
| Post-treatment, mean±SD | 13.25±0.15 | 0.43±0.01 | 4.46±0.08 | 96.64±0.44 | 29.69±0.32 | 30.69±0.30 | 40.62±7.70 |
| P value*, Paired t test | 0.123 | 0.001 | 0.132 | 0 | 0 | 0 | 0 |

*P<0.05 means significant; SD: Standard deviation; Hgb: Hemoglobin; Hct: Hematocrit; RBC: Red blood cell count; MCV: Mean corpuscular volume; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration

**Table 4:** Over all comparison of Hgb (in g/dL), Hct (mg%), RBC (×10^{12}), MCV (fL), MCH (pg), MCHC (g/dL) and reticulocyte count (%) before and after iron and ascorbic acid supplementation among undernourished children 5-10 years of age at Unang Lingap center, Barangay Vasra, Quezon city

| Laboratory parameters | Mean±SD | P value* |
|-----------------------|---------|---------|
| Iron supplementation alone (N=12) | | |
| Hgb (g/dL) | 12.67±0.66 | 12.79±0.94 | 0.074 |
| Post-treatment | 13.35±0.12 | 13.25±0.15 | 0.090 |
| Hct (mg%) | 0.39±0.02 | 0.39±0.03 | 0.863 |
| RBC count (×10^{12}) | 0.44±0.01 | 0.43±0.01 | 0.409 |
| MCV (fL) | 4.56±0.28 | 4.63±0.34 | 0.591 |
| Post-treatment | 4.54±0.05 | 4.46±0.08 | 0.006 |
| MCH (pg) | 86.16±3.89 | 85.28±3.07 | 0.533 |
| Post-treatment | 96.63±0.35 | 96.64±0.44 | 0.933 |
| MCHC (g/dL) | 27.83±1.31 | 27.66±1.47 | 0.761 |
| Post-treatment | 29.41±0.25 | 29.69±0.32 | 0.027 |
| Reticulocyte count (%) | 32.24±0.75 | 32.42±0.87 | 0.601 |
| Post-treatment | 30.43±0.30 | 30.69±0.30 | 0.042 |

*P<0.05 means significant; SD: Standard deviation; Hgb: Hemoglobin; Hct: Hematocrit; RBC: Red blood cell count; MCV: Mean corpuscular volume; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration

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Appendix A

ASSENT Form

English version

Study title:
Efficacy of iron supplementation alone versus iron and ascorbic acid supplementation in improving the hemoglobin, hematocrit, reticulocyte count and red cell indices of anemic undernourished children at Lingap Center, Barangay Vasra, Quezon city

1. Description of the study:
The objective of this research shall be the determination of effectiveness of iron supplementation alone versus iron and ascorbic acid supplementation, which shall be given to children identified with iron deficiency anemia, for 6 months. The hemoglobin, hematocrit, reticulocyte count and red cell indices shall be extracted before intake of either iron supplementation or iron and ascorbic acid supplementation. These same laboratory tests shall be determined 6 months after regular intake of supplementation.

2. Risks or discomforts of participating:
The child should inform his/her parents if they are sick or in pain as a result of being in the study.

3. Confidentiality:
The child’s participation in the study will be kept secret, but information about him/her will be given to the researcher.

4. Contact information:
If you have questions about the study but want to talk to someone else who is not a part of the study, you can call Dr. Balthazar Villaraza at Veterans Memorial Medical Center (telephone number 9276426 at local 2604).

5. Voluntary participation:
You can stop being in the study at any time without getting in trouble and your doctor will continue to treat you if treatment is necessary and available.

Signature

If you agree to be in this study, please sign here:

Signature of child over printed name    Date

Signature of parent/guardian over printed name    Date

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Source of Support: Nil. Conflict of Interest: None declared.
Appendix B

ASSENT Form
Tagalog version

Pahintulot Ng Magulang
Pamagat ng Pag‑aaral:
Efficacy of iron supplementation alone versus iron and ascorbic acid supplementation in improving the hemoglobin, hematocrit, reticulocyte count and red cell indices of anemic undernourished children at Lingap Center, Barangay Vasra, Quezon city

1. Paglalarawan ng Pag‑aaral:
Ang layunin ng pananaliksik na ito ay ang tungkol sa pagiging epektibo ng iron supplementation mag‑isa kumpara sa iron at ascorbic acid supplementation, kung saan ay ibibigay ito sa mga batang nakilala sa iron deficiency anemia, para sa anim na buwan. Ang hematocrit, reticulocyte count at red cell indices ay gagamitin at kukunin bago magsimula ng paginom ng supplementation at pagkatapos ng anim na buwan ng pag‑inom.

2. Panganib sa Kalahok:
Ang bata ay dapat ipagbigay‑alam sa kanyang/ang kanyang mga magulang kung sila ay may sakit o sa sakit bilang isang resulta ng pagiging sa ang pag‑aaral.

3. Pagiging kompidensiyal:
Ang paglahok ng bata sa pag‑aaral ay pinananatiling lihim, ngunit ang impormasyon tungkol sa bata ay ibibigay sa gumagawa ng pananaliksik.

4. Contact Information:
Kung mayroong mga katanungan tungkol sa pag‑aaral ngunit nais na makipag‑usap sa ibang tao na hindi bahagi ng pag‑aaral, maaaring tawagan si Dr. Balthazar Villaraza sa Veterans Memorial Medical Center (numero 9276426 sa lokal 2604).

5. Boluntaryong Pagsali:
Maari ng itigil ang pagsali sa pag‑aaral anumang oras nais; patuloy ang pag‑gamot ng iyong doktora kahit wala na sa pag‑aaral.

LAGDA

Kung may pahintulot na makilahok sa pag‑aaral na ito, maaaring pumirma sa ibaba:

| Lagda sa Ibabaw ng Printed na Pangalan | Petsa |
|----------------------------------------|-------|
| Lagda ng Magulang o Tagpangalaga        | Petsa |
| Proposed 24‑H Food Recall Chart        |       |
| Date:                                  |       |
| Name of Mother/Caregiver:              | Age:  |
| Name of Child:                         | Weight|
|                                        | Age:  |

24‑Hour Food‑Recall Chart

| Menu            | Ingredients/Content | How Many Times Given | How Much Was Given |
|-----------------|---------------------|----------------------|--------------------|
| Breakfast       |                     |                      |                    |
| Lunch           |                     |                      |                    |
| Dinner          |                     |                      |                    |
| Snacks          |                     |                      |                    |