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Original Article

Comparison of Ferrous Sulphate with Iron Polymaltose in Treating Iron Deficiency Anaemia in Children

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Abstract

Background: To compare the efficacy of ferrous sulphate vs Iron polymaltose complex for the treatment of iron deficiency anaemia in children.

Methods: In this randomized control trial , 170 children having iron deficiency anaemia with hemoglobin< 10g/dl and serum ferritin levels below 6ng/ml were selected . Patients were randomly allocated into Group A, given Syrup ferrous sulphate in a dose of 6mg/kg/day of elemental iron once daily for 4 weeks and Group B, given syrup iron polymaltose complex in a dose of 6mg/kg/day of elemental iron once daily orally for 4 weeks.

Results: - The average age was 24.86±17.85 months. The efficacy was significantly high in ferrous sulphate as compare to Iron polymaltose complex for the treatment of iron deficiency anaemia (p=0.009).

Conclusion: Ferrous sulphate has advantage over iron polymaltose complex in treatment of iron deficiency anaemia where rise in haemoglobin was considered

Key Words: Iron deficiency anaemia, Ferrous sulphate, Iron polymaltose, Haemoglobin levels

Introduction

Anaemia is a major health problem throughout the world. Iron deficiency is most common of nutritional deficiencies in childhood worldwide particularly in developing countries. Children with iron deficiency anaemia present with pallor, irritability, anorexia and lethargy. Ferrous sulphate and iron polymaltose (ferric form) are most commonly used preparations. The efficacy, bioavailability, side effects and cost of these preparations vary. This study is designed to find out a drug with better efficacy that can be used for treatment of iron deficiency anaemia in local population Anaemia is defined as haemoglobin level of less than 5th percentile for particular age group.[1] Anaemia is a major health problem throughout the world and children under 5 years of age are at highest risk.[2] Nutritional deficiency is most common cause of anaemia in children under two years of age due to high rate of growth and increased demand of iron, Vitamin B_{12} and folic acid.[3]

Iron deficiency is most common of nutritional deficiencies in childhood worldwide particularly in developing countries. According to a study conducted in Karachi, anaemia is the most common micronutrient deficiency in malnourished children of Pakistan accounting for 78 %.[4] About 1.62 billion people worldwide are having iron deficiency anaemia. Preschool children are mostly affected in whom the incidence is 47 % of total population affected.[5] Children between 6 months to 2 years of age are more prone to have iron deficiency anaemia and most common cause for this is late introduction of solid foods. However recurrent episodes of upper respiratory tract infection, diarrhoea, trauma and surgery are also associated with severity of anaemia. [6]

Children with iron deficiency anaemia present with pallor, irritability, anorexia and lethargy. As haemoglobin level falls further, tachycardia and even high output cardiac failure may occur. Some children may present with pica and pagophagia. Iron deficiency anaemia can result in fatigue, may affect excessive tolerance and work capacity, reduce neurotransmitter functions, diminish immunological and inflammatory defences. Iron deficiency may increase risk of psychiatric illness in later life.[7]

After finding out the underlying cause of iron deficiency anaemia in children, iron replacement therapy should be given to correct haemoglobin levels and for this oral route is preferred as it allows normal physiological mechanism of absorption of iron and prevents complications which are more common with intravenous route. Different oral iron preparations are available. Ferrous sulphate and iron polymaltose (ferric form) are most commonly used preparations. The efficacy, bioavailability, side effects and cost of these preparations vary. In a study ferrous sulphate was compared with Iron polymaltose complex preparation. The result showed that ferrous salt is treatment of choice in iron deficiency anaemia due to their high effectiveness, low cost and better

tolerability.[8] Treatment failure is commonly due to non medication adherence, adverse effects and lack of evidence based management guidelines. [8]

Bopche et al conducted a study on the efficacy of ferrous sulphate vs Iron polymaltose complex for treatment of iron deficiency anaemia in children and suggested that number of children showing increase in haemoglobin as well as the level of rise in mean haemoglobin was significantly more in ferrous sulphate group at follow up.[9]

Patients and Methods

This study was conducted in OPD of Paediatric Department Holy Family Hospital Rawalpindi. Duration of study was 6 Months from August 2014 to February 2015. It was a randomized control trail. Patients (n=170) were selected with non-probability consecutive sampling technique. They were divided into two groups with 85 patients in each. Inclusion criteria was all children with iron deficiency anaemia in age group 9 months to 5 years (hemoglobin < 10g/dl and serum Ferritin levels below 6ng/ml). Exclusion criteria was children with haemolytic anaemia, with history of repeated blood transfusions, with any type of mal-absorption syndrome and children with diarrheal illnesses. Before starting iron therapy all the patients in the study group were dewormed and asked to avoid tea, coffee and phytates.

Group A was given ferrous sulphate in a dose of 6mg/kg/day of elemental iron once daily for 4 weeks orally in syrup form. Group B was given Iron Polymaltose complex in a dose of 6mg/kg/day of elemental iron once daily orally for 4 weeks. Both the groups were called for follow up . Haemoglobin level was measured t. Patients with no rise of haemoglobin after iron therapy was further evaluated. The cost of medicine and lab investigations was beard by the department. Frequencies and percentages were calculated for qualitative variables i-e gender and efficacy (≥ 2g/dl of rise in Hb). Chi square test was used to compare the efficacy in both groups. P value <0.05 was considered significant. Effect modifiers like age, gender was controlled by stratification. Post stratification chi-square test was applied keeping level of significance<0.05.

Results

Majority were in age group less than one year(Table 1).Male constituted more than 505 (Table 2).The average age, pre HB and serum ferritin was 24.86±17.85 months, 8.36±1.01 and 5.03±0.50 ng/dl (Table 3). Efficacy in term of rise in haemoglobin after 4 weeks of iron therapy was significantly high with ferrous sulphate as compared to iron polymaltose complex (87.1% vs 70.6%) (Table 4). Stratification analysis was performed and observed that there was no effect of age group and male gender on efficacy (Table 4 to 6). In female cases significant effect was observed (Table 6).

Table 1:Age distribution with respect to groups

Age	Ferrous Sulphate	Iron polymaltose complex
<=12 Months	35.29%	45.88%
13 to 24 Months	32.94%	22.35%
>24 Months	31.76%	31.76%

Table 2.Gender distribution according to groups

Gender	Ferrous Sulphate Group	Iron polymaltose complex Group
Male	72.94%	74.12%
Female	27.06%	25.88%

Table 3.Demographic and baseline statistics with respect to groups

Variables	Overall	Group A	Group B
Age (months)	24.86±17.85	24.89±17.2	24.82±18.55
Serum ferritin (ng/dl)	5.03±0.50	5.08±0.49	4.99±0.50
Pre HB	8.36±1.01	8.16±1.14	8.61±0.77

Table 4.Comparison of efficacy between groups after 4 weeks of iron therapy

Comparison of efficacy between groups after 4 weeks of iron therapy					Comparison of efficacy between groups after 4 weeks of iron therapy≤ to 12 months age			
Efficacy	ferrous sulphate n=85	iron poly maltose complex n=85	total	p-value	efficacy	ferrous sulphate n=30	iron poly maltose complex n=39	p-value
Yes	74[87.1%]	60[70.6%]	134[78.8%]	0.009	Yes	26[86.7%]	27[69.2%]	0.149
No	11[12.9%]	25[29.4%]	36 [21.2%]		No	4[13.3%]	12[30.8%]	

chi-square =6.907 Fisher exact test

Table 5.Comparison of efficacy between groups after 4 weeks of iron therapy

13 to 24 Months age				>24 months age			
Efficacy	Ferrous Sulphate n=28	Iron Poly Maltose Complex n=19	P-Value	Efficacy	Ferrous Sulphate n=27	Iron Poly Maltose Complex n=27	P-Value
Yes	25(89.3%)	14(73.7%)	0.24	Yes	23(85.2%)	19(70.4%)	0.32
No	3(10.7%)	5(26.3%)		No	4(14.8%)	8(29.6%)	

Fisher Exact test used Fisher Exact test used

Table 6.Comparison of efficacy between groups after 4 weeks of iron therapy for male

Male				Female			
Efficacy	Ferrous Sulphate n=62	Iron Poly Maltose Complex n=63	P-Value	Efficacy	Ferrous Sulphate n=23	Iron Poly Maltose Complex n=22	P-Value
Yes	53 (85.5%)	46 (73%)	0.086	Yes	21 (91.3%)	14 (63.6%)	0.035
No	9 (14.5%)	17 (27%)		No	2 (8.7%)	8 (36.4%)	

Chi-Square test applied Fisher Exact test applied

Discussion

Iron deficiency (ID) and iron-deficiency anaemia (IDA) continue to be of worldwide concern. Among children in the developing world, iron is the most common single-nutrient deficiency. [11] In industrialized nations, despite a demonstrable decline in prevalence, Iron deficiency anaemia remains a common cause of anaemia in young children. [12] However, even more important than anaemia itself is the indication that the more common Iron deficiency without anaemia may also adversely affect long-term neurodevelopment and behaviour and that some of these effects may be irreversible.[13] The magnitude of iron deficiency anaemia (IDA) in Pakistan is immense and incurs a health care burden as high as 65% of general population including children and adults.[14] According to WHO, 43% children worldwide and 29% children in Pakistan are affected by iron deficiency.[14] Children below 2 years, especially at start of complementary feeding are at higher risk because of rapid growth and increased demand. The situation is further complicated due to factors like diet, socioeconomics and biology. [15]

Iron salts have long been used for the treatment of iron deficiency anaemia with ferrous sulphate being most common choice for all ages. There were 170 children with iron deficiency anaemia with haemoglobin < 10g/dl and serum Ferritin levels below 6ng/ml selected for this study. Out of these there were 125(73.5%) male and 45(26.5%) female. This male to female ratio is comparable to other studies.[14,16] Irfan Ullah Marwat et al reported that 54.7% patients were male with M: F ratio 1.2:1.[16] In Afzal et al study, the male-to-female ratio was 2:1 suggesting male predisposition compared to female children.[14]

Oral iron supplementation is well accepted and time tested mode of treatment of Iron deficiency anaemia in all age groups except very few cases of gastrointestinal intolerability.[17] However, poor compliance and prolonged duration of treatment are limiting factors in effective management of this important problem. A joint UNICEF/USAID consultation has recommended that the most practical iron supplement for use in infants and young children should be an aqueous solution of a soluble ferrous salt, such as ferrous sulphate (FS) or a ferric complex, such as iron polymaltose(IPC)[18]. Both of them have been demonstrated to have equivalent bioavailability in infants.[19,20] Present study showed that number of children showing increase in haemoglobin as well as the level of rise in mean haemoglobin was significantly more in Ferrous sulphate group at follow up. The results are similar to that reported by Yasa et al, Arvas, et al and Langstaff, et al..[10,21,22] In contrast, both preparations were found to cause equivalent increase in haemoglobin and serum iron levels by Sozmen, et al and sheikh et al. [23,33]. Some studies also concluded that equal amount of iron is available from ferrous sulphate or iron polymaltose complex in correcting haemoglobin levels over a twelve weeks observation

period. There was no difference whichever drug was given.[24,25] In some other studies, the response to Iron polymaltose complex was not adequate.[26,27] Though the gastrointestinal side effect is more in ferrous sulfate group, yet the residual complaints were more in the iron polymaltose groups.

In different studies it is concluded that ferrous sulphate was much better treatment option. Mean haemoglobin level increased significantly with ferrous sulphate. Results of this study are consistent with our study.[28-33]

Conclusion

1.Iron deficiency anaemia in children needs effective treatment modalities to be adopted. Compliance plays an important role in this easily treatable problem.

2. Ferrous sulphate is superior over iron polymaltose complex in treatment of iron deficiency anemia where rise in hemoglobin was considered.

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