ORIGINAL ARTICLE

Comparison of Efficacy of Ferrous Sulfate and Iron Polymaltose Complex in the Treatment of Childhood Iron Deficiency Anemia

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ABSTRACT

Aim: To compare efficacy of ferrous sulfate (FS) with iron polymaltose complex (IPC) in treating childhood iron deficiency anemia.

Methods: This randomized trial was conducted at Department of Pediatrics Bahawal Victoria Hospital, Bahawalpur from February 2016 to August 2016. Total of 70 children aged 6months to 6years having IDA were enrolled. They were randomly allocated to 2 groups. In IPC Group, iron polymaltose complex was given while in FS group ferrous sulfate was given for 2 months. The dose of iron preparations given was 6mg/kg/day of elemental iron in 3 divided doses.

Results: Out of 70 children, 39(55.7%) were male and 31(44.3%) were female. Mean age of children was 2.46 years±1.36 SD. Majority of children (60%) were under 2 years. Mean weight of children was 10.7 Kg. Majority of children, 4 (65.7%) were <12 Kg, 24(34.3%) were 12Kg or more. Mean Hb and ferritin before start of therapy in studied children were 7.85g/dl±0.82 SD and 8.22ng/ml±2.42 SD respectively. Mean post treatment Hb and ferritin in studied children were 10.9g/dl ±0.90 SD and 42.8ng/ml±21 SD respectively. Compliance was good in 94.3% children in IPC group and 85.7% children in FS group. While comparing both groups efficacy was seen in 32(91.4%) children in IPC group and 30 (85.8%) children in FS group which was insignificant statistically (P value=0.45).

Conclusion: Results of this study revealed that there was statistically insignificant difference in the efficacy rate of iron polymaltose complex and ferrous sulphate when used as an oral iron replacement treatment in children with iron deficiency anemia. Ferrous sulfate and iron polymaltose can be used as alternative drugs as both have comparative efficacy.

Keywords: Ferrous sulfate, iron deficiency anemia, polymaltose complex, WHO, neurotransmitter

INTRODUCTION

Globally iron deficiency (ID) is most common nutritional disorder.About 30% of world population suffer from irondeficiency anemia (IDA)[1]. According to WHO, 1 out of every 2 pre-school children are suffering from IDA in developing countries[2,3]. Iron deficiency anemia (IDA) can result in fatigue, may affect work capacity and exercise tolerance, reduce neurotransmitter function, diminish immunological and inflammatory defenses[4].

Iron deficiency may occur due to inadequate iron intake, decreased intestinal absorption of nutritional iron, increased iron requirement (e.g., during periods of rapid growth), or chronic blood loss. Long-term oral iron is frequently used as a first line therapy, but iron salts such as ferrous sulfate (FS) are frequently associated with high incidence of gastrointestinal side effects such as nausea, vomiting, diarrhea and constipation and may cause discontinuance of treatment[5]. Polynuclear preparations based on the ferric form of iron such as iron polymaltose complex (IPC) have been developed to improve tolerability[6].

The issue of efficacy between two therapies remains unsettled yet. This study is planned to clarify this issue and to confirm whether there is any significant difference between efficacy of FS and IPC or there is no significant difference between the two.

MATERIALS AND METHODS

This randomized trial was conducted at Department of Pediatrics Bahawal Victoria Hospital, Bahawalpur from February 2016 to August 2016.

Children of either sex from6 months to 6 years of age, with iron deficiency anemia, viz. children with baseline hemoglobin (Hb before starting therapy) <10.5 and serum ferritin ≤ 15ng/mL were included.

Exclusion criteria:

1. The main exclusion criteria are anemia due to other causes except IDA
2. Severe concurrent illness (cardiovascular, renal, and hepatic).
3. Known hypersensitivity to ferrous or ferric preparations.

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4. Bleeding disorders suggested by history of bruises, bleeding from body orifices or visible bruises on examination.
5. Gastrointestinal bleeding suggested by history of hematemesis (bloody vomit), melena (black colored stools) or bloody stools.

OPERATIONAL DEFINITIONS:

Iron deficiency anemia: Iron deficiency anemia is defined as: hemoglobin <10.5g/dL and serum ferritin ≤ 15ng/mL.

Efficacy: This is defined as normalization of Hemoglobin (Hb≥10.5gm/dl) and serum ferritin(>15ng/ml), assessed after regular use of prescribed drug in adequate dosage (6mg/kg of elemental iron in 3 divided doses) for two months.

Data collection procedure: Total 70 children with iron deficiency anemia admitting in ward through outdoor or accident and emergency department fulfilling inclusion criteria were randomly allocated to two groups by lottery method. Informed consent obtained from the parents/guardian. One group (FS group) was given ferrous sulfate and the other one (IPC group) given iron polymaltose complex for 2 months. The dose of iron preparations given was 6mg/kg/day of elemental iron in 3 divided doses. Their demographic data as well as brief history was taken and brief physical examination was done. They asked to return for follow up after 2 months and advised to bring with them the used bottles or wrappers of used tablets. Their hemoglobin and ferritin level obtained on week 0 and 8. These investigations are available free of cost in pathological laboratory of Quaid e Azam Medical College Bahawalpur. Normalization of Hb concentration (Hb ≥10.5gm/dl) and serum ferritin (>15ng/ml) assessed after two months of start of treatment was considered as effective. All the data was entered on a pre-designed proforma for each patient.

SPSS-10.0 was used for statistical data analysis. Mean and standard deviation was calculated for weight, age, baseline hb, baseline ferritin, post treatment Hb and post treatment ferritin. Frequency and percentages were calculated for gender and efficacy. Efficacy between two groups was compared by chi square test. Effect modifiers/confounders (age, sex, weight) was controlled through stratification and post stratification Chi square test was applied to compare different strata. P value ≤0.05 was accepted as significant.

RESULTS

Total 70 patients (35 in each group) were selected for this study. Mean age of children was 2.46 ±1.36 years. In IPC group, mean age was 2.47±1.46 years and in FS group mean age of children was 2.46±1.28 years. Efficacy of treatment was noted in 32 (91.4%) patients in IPC group and in 30(85.8%) patients of FS group. Difference of efficacy rate between the both treatment groups was statistically insignificant with p value 0.45 (Table 1).

Out of 20 male patients of IPC group, efficacy was noted in 19 (95%) patients and out of 19 male patients of FS group, efficacy of treatment was noted in 15 (84.2%) patients. But the difference of efficacy rate between both groups was statistically insignificant with p value 0.13. Out of 15 female patients of IPC group, efficacy was noted in 13 (95%) patients. Among the 16 female patients of FS group, efficacy noted in 15 (84.2%) patients. Difference of efficacy rate in both groups was statistically insignificant with p value 0.50 (Table 2).

Patients of both group were divided into two age groups i.e. age group 6 months to <2 years and age group 2-6 years. In IPC group and FS group, 20 and 22 patients belonged to age group 6 months to <2 years and efficacy rate was 18(90%) and 19(86.36%) respectively. In age group 2-6 years, 15 patients belonged to IPC group and 13 patients belonged to FS group. Efficacy rate was 14(93.33%) and 11(84.62%) in IPC and FS group respectively. Difference of efficacy rate between IPC group and FS group for both age groups was statistically insignificant with p value 0.71 and 0.45 (Table 3).

Patients were divided into two weight categories i.e., ≤12 kg weight group and >12 kg weight group. In weight group ≤12kg, efficacy rate was 19(90.48%) and 20 (83.33%) in IPC and FS group respectively. The difference statistically insignificant (P=0.48). In weight group >12kg, efficacy rate was 13(92.86%) and 10(90.91%) respectively in IPC and FS group. But difference was insignificant(P=0.85) (Table 4).

Table 1: Comparison of efficacy between two groups

Group	Efficacy		Total
	Yes	No	
IPC Group	32 (91.4%)	3 (8.6%)	35
FS Group	30 (85.8%)	5(14.2%)	35

P value=0.45

Table 2: Comparison of efficacy between both groups for male and female

Group	Efficacy		Total	P. Value
	Yes	No		
Male patients of both groups				
IPC group	19 (95%)	1 (5%)	20	0.13
FS group	15(84.2%)	4(15.8%)	19	
Female patients of both groups				
IPC group	13(95%)	2 (5%)	15	0.50
FS group	15(84.2%)	1(15.8%)	16	

Table 3: Comparison of Efficacy between two groups for different age groups

Group	Efficacy		Total	P. Value
	Yes	No		
Age group 6 months to <2 years				
IPC Group	18 (90)	2 (10)	20	0.71
FS Group	19 (86.36)	3 (13.64)	22	
Age group 2-6 years				
IPC Group	14(93.33)	1 (6.67)	15	0.45
FS Group	11(84.62)	2 (15.38)	13	

Table 4: Comparison of Efficacy between two groups for different weight categories

Group	Efficacy		Total	P. Value
	Yes	No		
≤12 kg weight group				
IPC Group	19(90.48)	2 (9.52)	21	0.48
FS Group	20(83.33)	4(16.67)	24	
>12 kg weight group				
IPC Group	13(92.86)	1 (7.14)	14	0.85
FS Group	10(90.91)	1 (9.09)	11	

DISCUSSION

IDA is known to be the most common nutritional deficiency worldwide. It has significant impact on national progress on account of its adverse health consequences and economic losses of billions of dollars annually in developing countries[7].

In Pakistan most IDA effected population segments are females of reproductive age and children under 5 years[8]. Prevalence of iron deficiency anemia among children under 2 years in Pakistan was reported as 69%[9]. In our study, majority of children (60%) were under 2 years and 40% between 2-6 years. Similarly in another local study 74% children were under 3 years of age and 26% were between 3-5 years[10]. High prevalence of IDA in this age group is due to high iron requirement for rapid growth. Risk factors associated with a higher prevalence of ID anemia (IDA) include low birth weight, high cow's-milk intake, low intake of iron-rich complementary foods and low socioeconomic status[11].

In our study efficacy was seen in 91.4% children in IPC group and 85.8% in FS group which was statistically insignificant(p value 0.45). Results are comparable to other studies[12-14]which has shown similar results. In another local study[10] efficacy was 97% in FS group and 94% in IPC group with no significant difference. In our study IPC group, mean post treatment Hb was 11.0±0.77g/dl as compared to 10.9±1.02g/dl in FS group. These results are comparable to another study[13] in which the mean post treatment Hb values were 12.1±1.19g/dl with IPC vs. 11.9±1.84 g/dl with ferrous sulfate.

CONCLUSION

It was concluded that there was no statistically significant difference in the efficacy of iron polymaltose complex and ferrous sulphate when used as an oral iron replacement therapy in pediatric patients with iron deficiency anemia. FS salt less expensive as compared to IPC, but in cases where FS is not tolerated, IPC can be used as an alternative.

REFERENCES:

1. Kliegman RM, Stanton B, Geme J, Schor N, Behrman RE, editors. Nelson Textbook of Pediatrics. 19th ed. Philadelphia: Elsevier; 2011. p.1655-6
2. McLean E, Cogswell M, Egli I, Wojdyla D, Benoist B. Worldwide prevalence of anaemia 1993-2005. Geneva, Switzerland: World Health Organization; 2008
3. Mathers C, Steven G, Mascarenhas M. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva, Switzerland: World Health Organization; 2009
4. Lisa H, Darwin D, Gail M. Medical nutrition and disease: a case-based approach. 5th ed. San Francisco: Wiley-Blackwell; 2014.
5. Tolkien Z, Stecher L, Mander AP, Pereira DI, Powell JJ. Ferrous sulfate supplementation causes significant gastrointestinal side-effects in adults: a systematic review and meta-analysis. PLoS One 2015;10(2):e0117383.
6. Geisser P, Burckhardt S. The pharmacokinetics and pharmacodynamics of iron preparations. Pharmaceutics 2011;3(1):12-33.
7. Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian S. Anemia in low-income and middle-income countries. Lancet. 2012;378:2123-35. doi: 10.1016/S0140-6736(10)62304-5.
8. Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian S. Anemia in low-income and middle-income countries. Lancet. 2012;378:2123-35. doi: 10.1016/S0140-6736(10)62304-5.
9. Nestel P, Alnwick D. Iron-micronutrient supplements for young children. Summary and conclusions of a consultation held at UNICEF, Copenhagen, August 19-20, 1996.
10. Marwat IA, Hassan KA, Javed T, Chishti AL. Comparison of efficacy of Ferrous and Iron Polymaltose salts in the treatment of childhood Iron Deficiency Anemia. Ann King Edward Med Uni 2013;19(4):322-6.
11. Domellöf M, Braegger C, Campoy C, Colomb V, Decsi T, Fewtrell M. Iron requirements of infants and toddlers. J PediatrGastroenterolNutr. 2014 Jan;58(1):119-29.
12. Yasa B, Agaoglu L, Unuvar E. Efficacy, tolerability, and acceptability of iron hydroxide polymaltose complex versus ferrous sulfate: a randomized trial in pediatric patients with iron deficiency anemia. Int J Pediatr 2011: 524520. doi: 10.1155/2011/524520. Epub 2011 Oct 31.
13. Toblli JE, Brignoli R Iron(III)-hydroxide polymaltose complex in iron deficiency anemia / review and meta-analysis. Arzneimittelforschung. 2007;57(6A):431-8.
14. Saha L, Pandhi P, Gopalan S, Malhotra S, Saha PK. Comparison of efficacy, tolerability, and cost of iron polymaltose complex with ferrous sulphate in the treatment of iron deficiency anemia in pregnant women. MedGenMed, 2007 Jan 2;9(1):1.