ORIGINAL ARTICLE

Comparison of efficacy of injectable vs oral iron supplementation in severe protein energy malnutrition children - A double blinded randomized control trial.

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ABSTRACT

Background: Protein energy malnutrition is quite common in our country. One of the common preventable and treatable effect of malnutrition is iron deficiency anaemia. Malnourished children have multiple problems including anorexia and poor absorption from the gut. We decided to conducted a study

Aims: To compare the efficacy of injectable vs oral iron supplementation for treatment of iron deficiency anaemia inchildren with severe protein energy malnutrition and make recommendation for IV iron therapy in malnourished children with iron deficiency anaemia as first line therapy.

Study Design: A double blinded randomized case controlled trial (RCT)

Settings: This was a double blinded randomized case controlled clinical trial which compare the efficacy of oral iron vs IV iron supplementation in children with iron deficiency anaemia and severe protein energy malnutrition based on WHO Z-score charts. This study was carried out at pediatric department Avicenna Medical College.

Study Period: January 2017 to December 2017.

Methods: All the children were examined and investigations were carried out to establish diagnosis of iron deficiency anaemia and important information were recorded on proforma. The diagnosis of anaemia was based on WHO guidelines for anaemia in children and malnutrition was assessed using WHO growth chart (Z-Scoring). After diagnosis they were given oral iron and IV Venofer twice weekly using formula given below. These children were followed up fortnightly for a period of one months. Children with hemoglobin less than 10 gm/dl were considered as anaemic. Iron deficiency diagnosis was established using low serum ferrit in level along with microcytic, hypochromic picture on peripheral smear examination.

Results: Study results were analyzed using SPSS and chi square test was employed as test of statistical significance. Results were considered significant statistically if (P value <0.05).

Conclusion: Children with severe protein energy malnutrition and IDA showed significant and early improvement as compared to children with oral iron therapy. Injectable iron therapy is safe as only few minor side effects like pain abdomen, diarrhea, and constipation were observed.

Key words: Iron deficiency anaemia(IDA),Total iron binding capacity(TIBC), Complete blood count (CBC)

INTRODUCTION

Micronutrient-related malnutrition is one of important subtype of under nutrition. Iodine, Zinc, vitamin A& D, and iron are the most important micronutrient whose deficiencies represents a major threat to the health especially children. WHO provides recommendations on daily iron supplementation in infants and children for the prevention of anaemia and iron deficiency[1,2,3]. .April 1,2016, the United Nations (UN) General Assembly proclaimed 2016–2025 the United Nations Decade of Action on Nutrition. (WHO fact sheet May 2017)

Iron is important for production of hemoglobin that carries oxygen. Iron can be given as oral iron and intravenous iron form. This study was conducted to compare the efficiency of oral vs IV iron therapy in such children with iron deficiency anaemia. The study was carried out in department of pediatrics at Avicenna medical college.

Iron deficiency anemia (IDA) is common in children and is diagnosed clinically in the outpatient setting and confirmed with laboratory tests (Low hemoglobin (Hb), reduced mean corpuscular volume (MCV) and high RDW, low serum ferritin, low serum iron and elevated total iron-binding capacity (TIBC)[4].

Iron deficiency anaemia is managed with iron fortified cereals and breads, red meat, beans, green leafy vegetables, but when diet alone is insufficient, iron containing medication be given either orally or injection form. Oral iron is safe, convenient and cost effective. Common adverse effects of oral iron supplements include nausea, epigastric discomfort, and constipation. When there is no response to oral iron therapy, parenteral iron therapy is indicated. Indications for parenteral iron therapy include; chronic hemodialysis, celiac disease, atrophic gastritis, severe anemia, intolerance or noncompliance with oral therapy[17]. Intravenous iron preparations which are available presently include ferric gluconate, iron sucrose, iron dextran, and ferric carboxymaltose. Common side effects include anaphylactic reactions, hypotension, myalgia, arthralgia, nausea, vomiting, and fever[15].

Treatment with IV iron is a safe, effective and superior to oral iron and presents several advantages such as faster and higher increase in hemoglobinlevels[17]. we use iron sucrose complex (Venofer) in our study and is an efficient way of replenishing body iron stores in children with severe malnutrition. Proper utilization of this important therapeutic modality offers significant clinical benefits by reducing

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morbidity and mortality from many pathological conditions associated with iron deficiency[15,17].This study was conducted to gather scientific evidence regarding efficacy, side effects and safety of injectable iron therapy.

MATERIAL AND METHODS

This study was carried out at department of pediatrics at Avicenna Medical College Lahore, Pakistan. 200 children cases were enrolled in the study who fulfilled inclusion criteria. They were divided into two groups,(Group-1) control (n=100) and (Group-2) cases (n=100) after randomization using SPSS v20 and were assigned to receive IV Venofer (iron sucrose complex) and oral iron respectively).Children with weight between -2 to +2 (WHO Z-score) were taken as controls and children with weight more than -2(WHO Z-score) were taken as cases. All children were seen by pediatrician and after recording history under-went a complete physical examination before enrollment and during each follow up. Laboratory test including CBC, peripheral smear examination, serum ferritin and total iron binding protein (TIBC) were carried out to establish the iron deficiency anaemia and during follow up to assess the progress. Children with hemoglobin less than 10gm/dl were considered as anaemic. IV iron dosage was calculated using following equation;

Total iron deficit(mg)= Body weight(kg)*Target Hb-Actual Hb(g/dl) *2.4

This formula is valid for children weighing upto 35 kg(21).Calculated dose be administered in two divided dose per week. The required dose was given as slow IV infusion over 60 minutes. A pediatrician recorded the results (clinical and laboratory). During follow up rise in hemoglobin, serum ferritin and normalization of total iron binding capacity were also recorded as a measure for improvement. Children were also observed for any adverse reaction(pain abdomen, constipation, diarrhea and gut bleeding etc) were recorded and were divided into two groups as minor and major sided effects. Gut bleeding and anaphylaxis were considered as major side effects and absence of these was recorded as a measure of safety of iron therapy.

Data analysis: Chi-square test was used to evaluate the results using SPSS. Level of statistical significance was set at 0.05.In this study evaluation of role of iron therapy modality was focused on two aspects; correction of iron deficiency anaemia and decrease in long term complications (low IQ, behavioral problems) and side effects

RESULTS

Two hundred children were included in the study 100(50%) as cases and 100(50%) as control (Table 1). Gender distribution in case and control group was male: female ratio 40:60% in cases group while it was 46/54 in the control group. Differences of gender in study group (case and control) like gender was insignificant as p value (545 (CI 95%) (Fig-1). This could also mean that IV Venofer is a safe drug for the children with malnutrition. As for difference in blood parameters are concerned, initial assessment showed, in cases group, 70% showed low hemoglobin, low ferritin and high TIBC while 30% has low HB but ferritin and high TIBC. While in control group 58% had low hemoglobin, low ferritin and low TIBC while 42% has low hemoglobin but normal ferritin and high TIBC level. Statistical analysis showed it is insignificant as p value (0.142, CI95%). During subsequent first follow after 2 weeks ,28% in cases group and 10% in control group showed improvement but 66% of cases and 30% in control group showed improvement which is statistically significant as p value (0.000, CI95%). During second follow up 88%in cases group and 46% in control group showed improvement in blood parameters which again was statistically significant as p value (0.000,CI95%). while 8% in cases group and 34% in control group did not showed any significant improvement in hematological parameters. (Fig-2)

As for complication /safety of the drug was concerned. Results showed that 10% of cases and 30% of controls developed major side effect like GIT bleeding but which settled down without any intervention Statistical results showed that this while 60% develop minor reaction in like abdominal pain, vomiting and constipation in both groups while 60% of cases and 10% on controls tolerated the medication well and did not develop any side effects. Statistical analysis showed these differences were insignificant (P value 0.749, CI 95%) (Fig-3).

This could mean that the IV iron therapy is quite safe and efficient mean of managing iron deficiency in malnourished children.

Fig.1

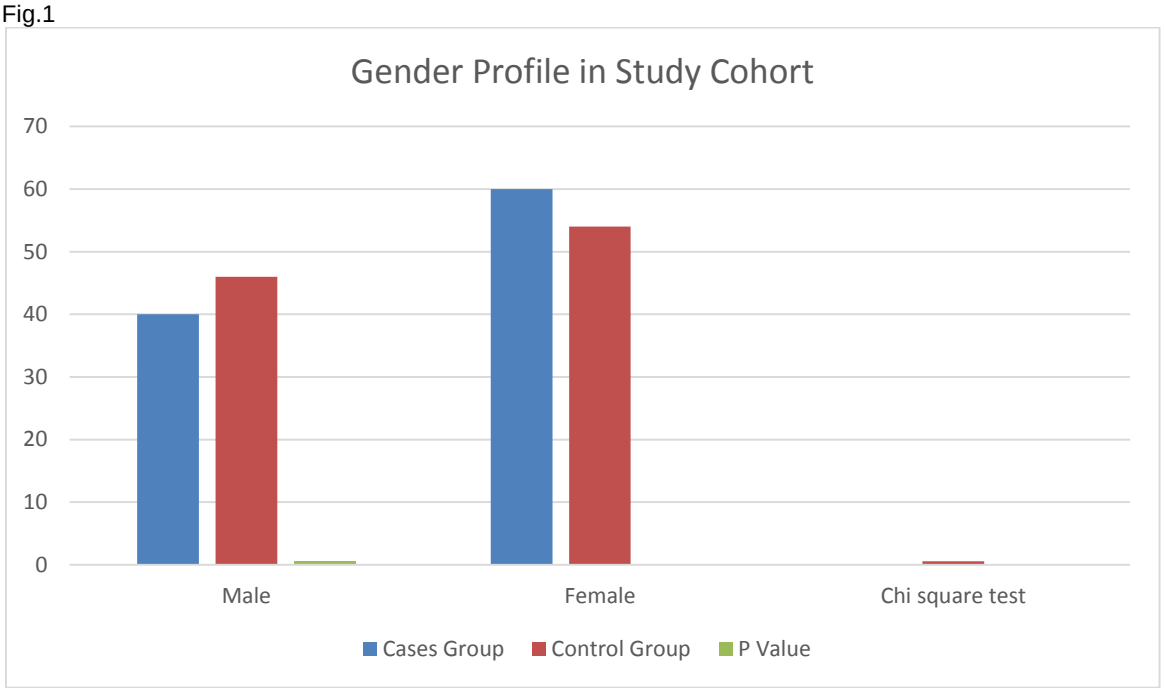


Fig.2:

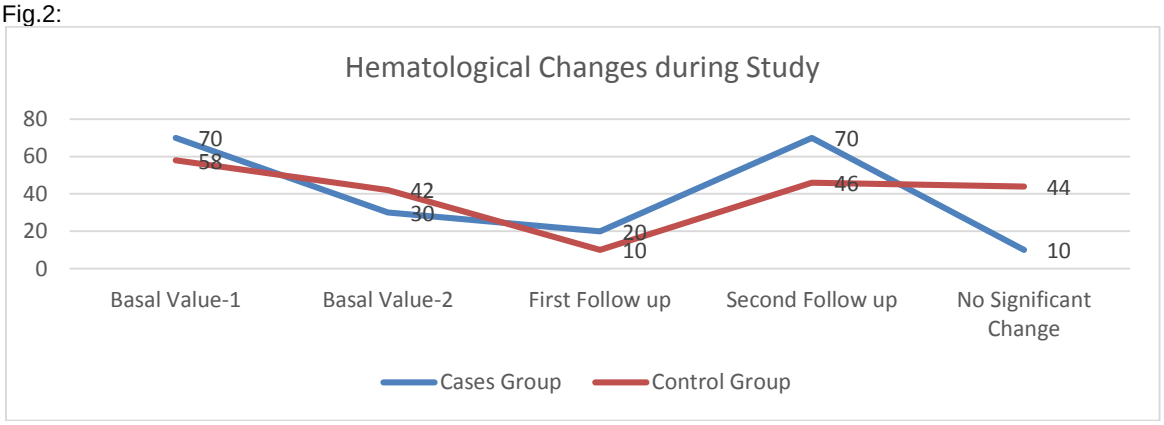
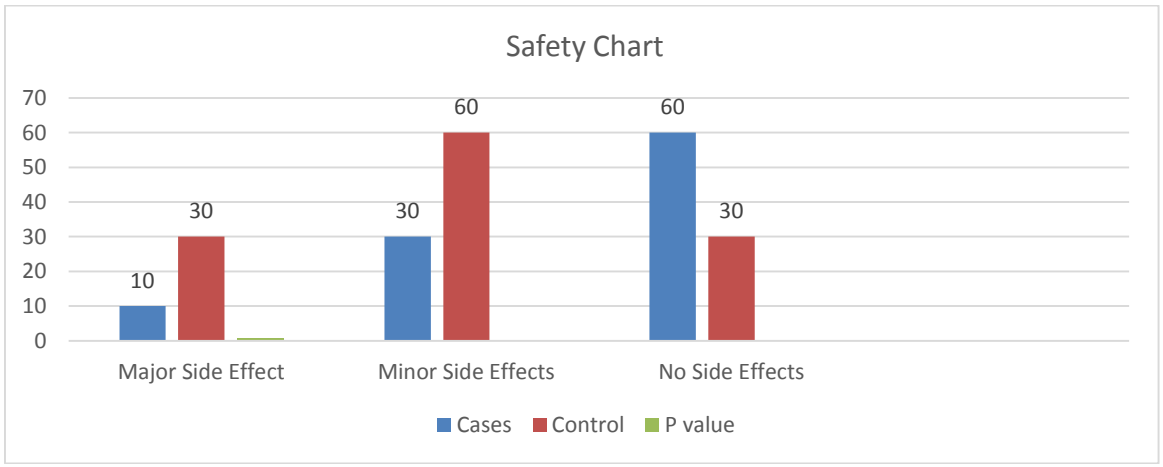


Fig. 3:



DISCUSSION

The results of our study are quite encouraging strongly suggest that IV iron therapy is an alternate and efficient method of managing iron deficiency and its consequences. The children who received IV iron instead of oral iron, showed early and better response as for as hematological parameters are concerned. There were also few children who did not responded well to IV /oral iron, reason not very clear. Moreover, this therapy can be considered as a safe alternate modality as very few patients developed major toxicity feature like Gut bleeding although not very severe and it settled down. Although quite a few children developed minor side effects like abdominal pain, constipation etc. Interestingly a quite a significant proportion (35%) did not develop any complication. So, it can be considered as a safe iron therapy for severely malnourished children who may have other malabsorption issues. These results of our study are the same as in previous studies[15,17].

Although our study results support IV iron therapy role in severely malnourished children but there are few limitations to this study being small sample size, single center and hospital-based study. I thing a broad based multicenter study would be more appropriate to verify results and get scientific evidence which might clear the way for a final recommendation can be made for use of this modality as a first line management strategy for IDA.

CONCLUSION

This study results depicts thatIV iron therapy is safe and effectives methods of IDA management inmalnourished children so its use should be considered. Very few children developed side effects mostly minor.

Recommendations: We suggest a broad-based multicenter study would be needed to verify results of injectable iron therapy in severely malnourished children with iron deficiency anaemia and IV iron therapy be considered as a first line therapy for malnourished children with IDA.

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