

## The Efficacy of Intravenous Iron on Anaemia in Pregnancy (A Comparative Study)

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### **Abstract:**

**Background:** As the surveys in different parts of India indicate that about 50-60 percent of women belong to low socio-economic groups are anaemic in pregnancy, having Iron & Folic acid deficiencies being the major etiological factors, it is necessary to study the efficacy of different therapeutic interventions of Iron to combat the above said problem.

**Objective:** To know the efficacy of the IV Iron therapy over oral Iron therapy among the study subjects.

**Study design:** It is a comparative Intervention study.

**Study Sample:** 100 Anaemic Antenatal Patients.

**Study Area:** Obstetric OP of Government General Hospital., Guntur.

**Study Subjects:** All the pregnant women of 14-32 weeks of gestation attending Government General Hospital, Obstetric OP suffering from Anaemia were included as study subjects.

**Study Period:** June 2012 to January 2013. Statistical Analysis: Measures of central tendency and dispersion, percentages, proportions and Z- test were applied.

**Results:** Significant rise of Haemoglobin, PCV, MCH, MCHC and serum Iron levels were observed after intervention among the study group who received intravenous Iron when compared to the study group who received oral Iron to control Anaemia.

**Keywords:** Anaemia, Intravenous, Iron sucrose, Haemoglobin, Packed Cell Volume (PCV), Guntur.

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### I. Introduction

Malnutrition is the cause of Nutritional anaemia which is a disease syndrome<sup>1</sup> and has been defined by WHO as “a condition in which the haemoglobin content of blood is lower than normal as a result of a deficiency of one (or) more essential nutrients, regardless of cause of such deficiency”<sup>2</sup>. By far the most frequent cause of nutritional anaemia is Iron deficiency<sup>3</sup>.

Iron deficiency anaemia is a worldwide problem which is estimated to affect nearly two-thirds of pregnant women in developing countries<sup>4</sup>. And it is also estimated that about 4-12 % of women of child-bearing age belonging to developed countries are also suffer from anaemia<sup>5</sup>.

In India the surveys conducted in different parts, indicate that about 50-60 % of women belonging to low socio-economic groups are anaemic during the period of pregnancy<sup>6</sup>. It is well known that anaemia per se associated with high incidence of premature birth, postpartum haemorrhage, puerperal sepsis and thromboembolic phenomena in the mother. Iron deficiency can arise either due to inadequate intake (or) poor bioavailability (less than 5 percent)<sup>7</sup> of dietary iron (or) due to excessive losses from the body.

During pregnancy there is a great demand for Iron to meet the requirement of RBC expansion in the mother, fetal & placental blood and the blood loss at delivery.

In our healthcare setup what we observe is most of the pregnant ladies came to health care facility within the short period of interval for delivery and when the patient is approaching term, the target is to achieve desired haemoglobin level in a limited time period. The oral and the older parental Iron preparations take long duration of time for haemoglobin to rise and associated with undesirable side effects. In this situation the IV infusion of Iron sucrose is a reliable alternative method for these kinds of patients to improve haemoglobin levels within short period of time. The early rise in haemoglobin levels is crucially important during final period of pregnancy as there is reduction in the risk of blood transfusion during peripartum period.

### II. Materials & Methodology

Every fifth Antenatal women belong to 14-28 weeks gestation and suffering from Iron deficiency Anaemia attending obstetric OP of Government General Hospital, Guntur during the period June 2012 to August 2012 were selected as study subjects.

According to hospital census the prevalence of Anaemia cases attending Antenatal OP was found to be 52%. The sample size was calculated by the formula  $N = \frac{4PQ}{L^2}$  where N= Size of the sample, P= 52, Q= 100-P i.e., 48% and L= 20% of allowable error in P i.e. 10.4 so N=92. Assuring there may be 10% attrition; additional 10% was taken which was calculated to be 100.

The information related to their Profiles, gravida, para gestational period was collected with a pre-tested proforma. Initially after selecting the study subjects, by means of blood test their anaemic status was screened basing on examination of peripheral blood smear and Hb levels. And those Hb level was found to be < 11g/dl were included actually in the study (100 members) after following the exclusion criteria and Inclusion criteria preliminarily. Then these study subjects were assigned to two groups of 50 each (Group 'I'/ Group 'O') by following the matching criteria related to Age, gravida, Para, socio-economic status etc.

All the study subjects were dewormed initially and the blood indices related to their anaemic status was measured before starting the Iron therapy which is our actual study intervention. A written consent was taken from all the study subjects after detailed explanation about the study purpose, therapeutic procedure, uses, side effects and drug compliance etc. Then the Group 'O' study subjects were given (started) oral Iron and Folic Acid tablets having the strength of 100mg of elemental Iron and 500mg of Folic Acid at the rate of one tablet BD up to 12 weeks and the drug compliance was checked by means of patient follow up. And Group 'I' study subjects were given 2 doses of IV Iron sucrose of 200mg per sitting 4 days apart on an OPD basis after diluting the injection with 100ml Isotonic saline solution over 30 minutes and no adverse reactions were observed with IV Iron sucrose. The required amount of iron was calculated by using the formula Total dose of iron required in mg =  $2.4 \times \text{wt} \times \text{deficit}$  (where deficit means target hb - actual hb present in g/dl). Re-estimation of the blood indices (Hb%, PCV, MCV, MCHC & Serum Iron) related to Anaemia was done after three weeks of IV treatment and twelve weeks of oral treatment.

The collected data was analysed by using appropriate statistical techniques with the help of computer software. The observations were discussed in the light of published material of various authors. The conclusions and recommendations were made after detailed study of observations.

### III. Results

**Table.1 Comparison of Haemoglobin levels before & after intervention therapy**

Hb Level	Group 'O'	Group 'I'	P < 0.05
Before	8.12 ± 0.45 (7.6 - 8.57)	8.13 ± 0.49 (7.6 - 8.6)	
After	9.2 ± 0.35 (8.8 - 9.5)	10.15 ± 0.48 (9.6 - 10.6)	

- It is observed that the Hemoglobin levels were significantly increased among the study group who treated with IV Iron when compared to the other group who treated with oral Iron.

**Table.2 Comparison of PCV & MCV Values**

Group	PCV		MCV	
	Before	After	Before	After
Group 'O'	31.04 ± 1.58 (29.4 - 32.6)	32.70 ± 1.69 (31 - 34.3)	90.52 ± 1.31 (89.21 - 91.8)	92.02 ± 0.98 (91 - 93)
Group 'I'	30.93 ± 1.42 (29.5 - 32.3)	35.16 ± 0.99 (34.1 - 36)	88.95 ± 1.29 (87.6 - 90)	95.05 ± 0.86 (94.1 - 95.9)
P Value	P < 0.05		P < 0.01	

- The PCV & MCV values are significantly increased among Group 'I' when compared to Group 'O' after intervention.

**Table.3 Distribution of MCH & MCHC values before and after intervention**

Group	MCH		MCHC	
	Before	After	Before	After
Group 'O'	27.68 ± 1.99 (25.6 - 29.6)	29.88 ± 0.89 (28.99 - 30.7)	31.71 ± 1.19 (30.7 - 32.6)	33.31 ± 1.19 (32.1 - 34.5)
Group 'I'	28.21 ± 1.42 (26.7 - 29.6)	34.6 ± 1.42 (33.1 - 36)	31.78 ± 1 (30.7 - 32.7)	36.03 ± 1.11 (34.9 - 37.1)
P Value	P < 0.05		P < 0.05	

- With the effect of therapeutic intervention the MCH & MCHC values were increased significantly among the study Group 'I' when compared to study Group 'O'.

Table.4 Comparison of Serum Iron levels before & after Iron intervention

Serum Iron	Initial	Final
Group 'O'	59.29 ± 1.31 (57.9 – 60.6)	64.17 ± 1.19 (62.9 – 65.36)
Group 'I'	60.75 ± 4.49 (56.2 – 65.2)	75.44 ± 4.66 (70.78 – 80.1)
P Value	<b>P &lt; 0.01</b>	

- Serum Iron levels also significantly increased among the study Group 'I' who received IV Iron when compared to study Group 'O' who received Iron orally.

#### IV. Discussion

The traditional treatment for anaemia in pregnancy is oral Iron supplementation but in severe cases blood transfusion is preferred. Some side effects like constipation, nausea and gastric irritation are usually associated with high doses of oral Iron which effect the compliance of treatment. And blood transfusion also associated with the risk of transmission of infections like Hepatitis B, and C, Malaria, HIV and the problem of transfusion reactions etc. In Indian scenario intravenous Iron has been considered as an alternative treatment modality to improve haemoglobin levels within short period of time.

In our study it was observed that the mean haemoglobin levels were significantly ( $P < 0.05$ ) increased after three weeks among the study group who treated with IV Iron (2g/dl) when compared to the other group who treated with oral Iron (1g/dl) after twelve weeks. IV Iron sucrose appears to be effective because it is rapidly removed from the plasma and used for erythropoiesis. The observed finding was almost correlated with the finding of the studies David B et al study (2g/dl)<sup>8</sup>, Deepti Shrivastava et al study (2.3g/dl)<sup>9</sup>, Broche D E et al (3.1 g/dl)<sup>10</sup>, Bhandal and Russel et al (2.58g/ dl)<sup>11</sup>, Jain Geeta et al (2.4 g/dl)<sup>12</sup> study on Post partum Anaemia, Dewan Bhupesh et al study (2.2g/dl)<sup>13</sup>, Avantika Gupta et al study (1.4g/dl)<sup>14</sup> and Dipti Agarwal et al study (3.5 g/dl)<sup>15</sup> respectively.

With reference to PCV & MCV also the values are significantly ( $P < 0.05$ , PCV &  $P < 0.01$ ; MCV) raised among Group 'I' when compared to Group 'O' after intervention. And related to MCH & MCHC values, with the effect of therapeutic intervention these values were also increased significantly ( $P < 0.05$ ) among the study Group 'I' when compared to study Group 'O' which is closely related to the study findings of Avantika Gupta et al study<sup>14</sup>.

In this study we observed that there was a significant ( $P < 0.01$ ) rise of serum Iron levels also among the study Group 'I' who received IV Iron sucrose when compared to study Group 'O' who received Ferrous Sulphate orally. And similar observation was identified in other studies conducted by A. Khalafallah, A. Dennis et.al study<sup>16</sup> & Alka Kriplani et al study<sup>17</sup> on Iron deficiency anaemia of pregnancy.

In our study the intravenous Iron-Sucrose was well tolerated and no serious adverse effects were reported. The reason for this was partly due to lower allergic effect of sucrose and very low release of elementary iron from the complex. This observation was also in accordance with the previous studies mentioned as references.

#### V. Conclusion

Our study results suggest that intravenous Iron Sucrose increases the Hb level more rapidly than oral ferrous fumarate in Antenatal Anaemia cases as a safe therapeutic intervention strategy with which we could avoid blood transfusion in young women.

#### VI. Recommendations

As IV Iron Sucrose helps in the improvement of blood indices related to increase of hemoglobin level with in short period of time and have not associated with serious adverse effects, it is definitely useful to the antenatal mothers who attend the hospital at short duration to delivery.

And also as there is an increased demand for Iron during pregnancy, women when not on supplements may slip into the depleted state leading to increased morbidity and mortality among the mothers and their product of conception, Iron supplements are advised and encouraged strongly to these target groups at all levels of health care setup. Iron supplements are advised even when the hemoglobin is within the normal levels as many women enter their pregnancy with depleted Iron stores and low haemoglobin is a late development in Iron deficiency and the supplement has beneficial effect on the growing fetus by which we could stop the effect of malnutrition beginning from the life at womb.

In India the other interventional measures like effective implementation of National Nutritional Anaemia Prophylaxis Programme, Iron fortification methods and health education focusing on the long-term strategies such as changing dietary habits, control of parasites and nutrition education etc.

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