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ORIGINAL ARTICLE

Treatment Efficacy of Oral and Intravenous Iron Delivery Routes for Anemic Pregnant Women

AMINA BUKHARI[1], SUGHRA ABBASI[2], SAMINA AHMED[3]
[1]*Gynecologist, Sindh Government Hospital Landhi, Karachi*
[2]*Associate Professor, Karachi Institute of medical sciences, CMH, Malir Karachi*
[3]*Chiniot Mother and child Hospital, Nazimabad, Karachi*
Correspondence to: Sughra Abbasi, Email: drsughra33@yahoo.com, Cell: 03002538747

ABSTRACT

Background: Although it particularly is prevalent in less-developed countries, anemia in pregnancy remains a significant problem in the developed world.
It is one of the major health issues during pregnancy. The principle cause of anemia is iron deficiency, which is dependent on the patient's dietary status. Treatment of iron deficiency anemia is critically essential during pregnancy to prevent bad maternal and neonatal outcomes
Objective: The study aimed to compare the oral and intravenous iron delivery routes in anemic pregnant women.
Study design: It is an experimental study. The 120 patients who visited the gynecology department of the hospital for the duration of one year from June 2021 to May 2022 were selected.
Material and Methods: The data was taken from 120 patients that were admitted in Department of Obstetrics and Gynecology of Sindh Government Hospital Landis, The duration of study was one year. All the patients were aware of the study, as written consent was taken from them. The oral iron intake was given to 58 women and to the other 62 women the intravenous injections of iron was administrated during their pregnancy. All the participants completed their follow-up sessions throughout the year. The blood samples and the other data related to pregnancy was collected from each patient.
Results: The back-count of tablets was carried out and it was observed that almost 89% women took their iron supplements daily. There were only 5% patients that took 50% of their iron tablets. The average dose that was given to women was 600mg in case of elemental intravenous iron. The average level of iron and ferritin are observed to be higher in the group administrated with intravenous injection as compared to the other group. The chances of hemoglobin rise were more in case of intravenously administered patients.
Conclusion: The study was carried out to compare the oral and intravenous iron delivery routes in anemic pregnant women. It was found that intravenous delivery route of iron in form of iron sucrose is safe and an effective method for the iron therapy in anemic pregnant women, as it restores the hemoglobin stores efficiently as compared to other group. However, it is costly as it need hospitalization. As an alternative oral iron can also be used if the women has severe iron deficiency in the third trimester.
Keywords: Intravenous iron delivery routes and anemic pregnant women.

INTRODUCTION

Iron deficiency anemia is the most common form of anemia the world over and also the most common nutritional disorder in the world

In both developing and developed nation anemia in pregnancy is the most frequently caused by iron deficiency? Oral iron replacement is most commonly used as the first line of treatment for iron deficiency anemia due to its efficacy, safety, and affordability[1-2]. The one of the major public health issues around the globe is anemia. It is one of the main causes of impairment worldwide. The term was characterized by the WHO as hemoglobin of less than 11 g/dl. The prevalence of anemia among pregnant women ranges from 23% in developed nations to 52% in developing nations. It affects 10% to 30% of the pregnant women[3-4]. The principle cause of anemia is iron deficiency, which is dependent on the patient's dietary status. Intravenous iron therapy is only administered to a limited percentage of patients after failure of oral medication or when the amount of iron lost cannot be replaced by oral therapy. The use of intravenous iron was restricted due to the serious systemic side effects associated with iron dextran and iron gluconate[5-6]. The unpredictable severe anaphylactic reactions can be induced by iron dextran and iron gluconate. It is reportedly safe and effective for the treatment of anemia. The transfusion rates of the iron deficient women may be reduced by the iron therapy[7-8]. Pregnancy frequently results in anemia. It affects 10% to 30% of expectant women, and it affects immigrants more commonly. Anemic women are at higher risk of blood transfusions during the peripartum period because they are less able to handle the physiological blood losses that occur during birth. These are also at the higher risk of developing placenta previa; a condition that cause continuous bleeding during pregnancy. It is an open-labelled randomized trail based study, conducted to compare the oral and compare the oral and intravenous iron delivery routes in case of anemic pregnant women[9-10].

MATERIAL AND METHODS

It is a randomized experimental study. In this study the randomized clinical trial were conducted on 120 patients for the duration of one year from June 2021 to May 2022. During the duration of one year the patients who were presented with the anemia at the gynecology and obstetrician department of the hospital were selected. The data was taken from the patients. All the patients were aware of the study, as written consent was taken from them. The ethical and review board committee of our institute teaching hospital approved the study. According to the inclusion criteria, the following patients were selected;

- The pregnant women with established iron deficiency
- The hemoglobin level of the women must be between 8-10 g/dL
- The ferritin levels of the pregnant women must be less than 13 µg/ L

According to the exclusion criteria, the following patients were excluded;

- The women with the serum folate level less than 4 pg/mL
- The pregnant women with vitamin B12 level less than100 pg/mL

The oral iron intake was given to 58 women and to the other 62 women the intravenous injections of iron was administrated during their pregnancy. All the participants completed their follow-up sessions throughout the year. The blood samples and all the data related to pregnancy was collected from each patient. The back-count of tablets was also carried out**.** The average dose that was given to women was 600mg in case of elemental intravenous iron. All the demographic and clinical features of the patients were reported. The statistical analysis was performed and the p-value was calculated. The hemoglobin level of the patients were

recorded after clinical analysis. The differences in hemoglobin levels after iron uptake by intravenous and oral route were also calculated. The SPSS software was used for the data stratification.

RESULTS

This study was carried out to determine the treatment efficacy of intravenous and oral route for iron intake. The oral iron intake was given to 58 women and to the other 62 women the intravenous injections of iron was administrated during their pregnancy. All the participants completed their follow-up sessions throughout the year. The blood samples and all the data related to pregnancy was collected from each patient. The back-count of tablets was carried out and it was observed that almost 89% women took their iron supplements daily. There were only 5% patients that took 50% of their iron tablets. The average dose that was given to women was 600mg (500–900 mg) (in divided doses) in case of elemental intravenous iron.

All the initial demographic features were same in both groups. There were some patients that were given oral supplements during the early pregnancy duration. The patients were not taking iron supplements other than the route selected for them by the doctors The mean hemoglobin levels were measures and analyzed as shown in the table.

The table one show the demographics and clinical characteristics of the selected women. The statistical analysis was performed and the p-value was calculated.

Table 1: The demographic and clinical characteristics of the women.

Features	Oral intake of iron	Intravenous intake of iron	P value
Age	27.2 ± 5.4	25.2±6	0.176
Weight (kg)	57±11	56±8	0.207
Vitamin B12	198±52	185±35	0.165
Folate (ng/ml)	12.1±3.4	10.0±2.8	0.207
Mean corpuscular volume	85.3±9	85.7±7.1	0.277
Serum iron	46	42	0.7
Previous iron supplements	8 (20)	12 (25)	0.66

The table depicts the hemoglobin level of the patients recorded after clinical analysis.

Table 2: The average hemoglobin levels in patients during the study

Time of the pregnancy	Hemoglobin level g/dL
Baseline	9.9
2nd Trimester	10.4
3rd Trimester	11.2
Delivery	12
Postpartum	10.4

The table depicts the differences in hemoglobin levels after iron uptake by intravenous and oral route with the p-value.

Table 3: The differences in hemoglobin level

	Intravenous iron	Oral iron	P value
$Hb^{2ndtimester}–Hb^{-baseline}$	0.7	0.3	0.003
$Hb^{3rth\ trimester}–Hb^{-2nd\ week}$	0.7	0.4	0.031
$Hb^{delivery}–Hb^{-4th\ week}$	0.8	0.8	0.675
$Hb^{postpartum}–Hb^{-delivery}$	1.5	1.5	0.8

Table 4: The differences in hemoglobin level according to baseline measurement

	Intravenous iron	Oral iron	P value
$Hb^{2ndtrimester}–Hb^{-baseline}$	0.7	0.3	-0.005
$Hb^{3rd\ trimester}–Hb^{-2nd\ week}$	1.3	0.7	-0.001
$Hb^{delivery}–Hb^{-4th\ week}$	2.2	1.4	-0.002
$Hb^{postpartum}–Hb^{-delivery}$	0.9	0.3	-0.09

DISCUSSION

The study was carried out to analyze the results of patients receiving oral and intravenous irons during pregnancy. The study was performed on 120 patients attending department of obstetrics and Gynecology- Sindh government Hospital- Landhi, the duration of study was one year. Our study revealed that administration intravenous iron elevates the hemoglobin levels and iron stores are improved as compared to oral iron intake. Therefore, the intravenous administration of iron is better than oral iron polymaltose complex The average level of iron and ferritin throughout the study duration was found to be higher in group that were given intravenous Iron as compared to the oral iron group. The chances of hemoglobin rise were more in case of intravenously administered patients. The targeted level of hemoglobin was achieved more efficiently by intravenous group than the other group at the 2nd trimester of pregnancy and at the time of delivery. As per studies it was found that the intravenous iron therapies have more chances of producing erythropoietic response in case of anemic pregnant women. The delivery of iron to the marrow plays important role in the proliferation of marrow. The pharmacokinetic characteristics of iron sucrose and iron dextran are different[11-12]

The strength and stability of iron sucrose is moderate level. As it is rapidly cleared from the serum, it has a half-life of 5-6 hours. As compared to intramuscular and oral drug administration, the level of hemoglobin was much more in intravenous iron dextran administration[13-14.] The maternal iron stores were quickly restored in case of intravenous delivery of iron dextrose in this study. As per studies it was found that in case of patients receiving additional iron supplements, the sucrose iron was suggested by doctors as an iron therapy[15]. There were multiple previous studies that compared the intravenous iron sucrose intake and oral iron sucrose therapy and the results showed that the iron sucrose if given intravenously can increase the hemoglobin levels in a shorter period of time as compared to other group. There were only less than 35% patients that had bad experience with oral drug administration, however, the majority of the patients reported no complications. As per previous study it was found that there was success in raising hemoglobin level in both oral and intravenous groups, the patients in oral iron intake group showed excellent raise in hemoglobin levels[16-17]. The previous studies showed similarities with our results, however, the iron sucrose dose was given to the women for 21 days that was a longer duration as compared to the duration of drug administration used in our study. Moreover, the sample size was also smaller in other studies[18-19]. According to the literature the iron uptake by using oral route can be successful but it also depends on a number of factors. The dietary habits of patient play an important role in deciding the route of administration. The kind of meal the patient is taking, plays important role in the absorption of iron, the rate of absorption of iron is less in cases where the dose is taken after or during the meal. These factors can be discussed well in case of smaller study samples[20-21].

In our study it was revealed that use of iron sucrose has a very less chance of allergic reaction, as the occurrence of adverse allergic effects were less in case of iron sucrose, and there was no death case reported as per our studies[20]. However, the conditions like gastrointestinal adverse issues were more commonly found in the oral iron uptake group. There were some patients that were given folic acid supplements as well during iron therapy but this was done when the person had mild symptoms and no patient left the medication. Low birth weight is one of the consequence of iron deficiency in case of pregnant women, however, our study showed that the birth weight of the fetus was not showing any variation in both groups. In this study there was no analysis done about the transfusion rates in case of both groups.

CONCLUSION

The study evaluated the Intravenous compared to oral iron for the treatment of iron-deficiency anemia in pregnant women. Intravenous delivery route of iron in form of iron sucrose is an effective method for the iron therapy in anemic pregnant women, as it restores the hemoglobin stores efficiently as compared to other group. However, it is costly as it need hospitalization. In

addition, patient should be given dietary advice on how to maximize iron intake during pregnancy

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