Original Article

Outcomes of Total Dose Infusion Therapy in Pregnant Women with Iron Deficiency Anemia

Aisha Kanwal, Roohi Nigar, Maryam Phulpoto, Yar Muhammad Waryah

ABSTRACT

OBJECTIVE: This study was aimed to access the capability of total dose infusion iron therapy for maintaining the hemoglobin level in local pregnant women

METHODOLOGY: A descriptive study was carried out by using non probability consecutive sampling type and duration of study started from June-December 2019 at BMC Hospital Kotri and Civil Hospital Karachi. A total of 227 pregnant women with iron deficiency anemia were included in this study for total dose infusion (TDI) iron therapy through intravenous and pregnant women with normal hemoglobin and iron level were excluded. The patients were selected on the basis of constructed Performa details, CBC, Reticulocyte count, serum ferritin and TIBC parameters were recorded and measured before and after the therapy. The results were recorded from day 1 to 14; data were analyzed through SPSS version 16 software.

RESULTS: The positive outcome of total dose infusion in pregnant anemic patients of iron deficiency anemia was observed in 80.62% (183/227). The upper middle class and well- educated families were also on high risk of iron deficiency anemia, the quick and satisfactory results were also obtained from upper middle class and well-educated families. The 80% of patents gave a positive response with in 14days of TDI whereas only 20% required more than 14 days for maintaining their hemoglobin level

CONCLUSION: TDI is a safe, effective, a fast and quick method to restore the level of hemoglobin, especially in case of pregnancy to improve iron deficiency in pregnant anemic patients.

KEY WORDS: Iron deficiency anemia, Total dose infusion, Hemoglobin level

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INTRODUCTION

The anemia deficiency of iron is a frequent type of anemia in females worldwide and approximately 50% of anemia is caused due to iron deficiency[1]. According to the WHO record, 1.6 billion female individuals are affected with anemia and overall more than 1.2 billion individuals affected across the globe[2,3]. The incidence of anemia is 3-4 times higher in developed countries, in pregnant women the highest 41% of frequency was recorded and 30% was reordered in non-pregnant women[4]. Globally during pregnancy anemia is a most common community health problem and is caused due to low concentration of hemoglobin level than (<10.5 g/dl)[5]. The nutritional deficiencies are the reasons for anemia in pregnancy and it can be aggravated by various other conditions such as placental bleedings, peripartum blood loss and gastrointestinal bleedings, which result in the loss of red blood cells[6]. The severity of anemia is measured by the complete blood count including hemoglobin concentration and hematocrit concentration. The low hemoglobin and hematocrit concentration are mostly associated with the anemic disease.

Microcytic hypochromic anemia during pregnancy is well-defined in Pakistan and other countries[7,8]. Mostly Oral iron treatment is used as the first choice for anemia deficiency patients and positive results were obtained. Parenteral treatment is used for those patients, who do not respond to oral treatment and quick restoration of hemoglobin level is required. In the case of pregnancy, Low molecular weight (LMW) iron dextran is used as a total dose infusion (TDI)[9], TDI of LMW iron dextran treatment showed to be risk free and effective during different clinical conditions including pregnancy, renal failures, intestinal bypass, the restless legs syndrome, excessive uterine bleeding and peripartum period[10].

Anemia is a common health problem in pregnant women and caused severe symptoms of irregular heartbeats and shortness of breath. This study was designed to investigate the effect of total dose infusion (TDI) in pregnant anemic patients. The progressive improvement was observed after treatment with iron dextran and the iron level was maintained up to the normal range. The TDI treatment was compared with the socioeconomic status of patients and the significant changes were observed in upper-class and educated patients.

METHODOLOGY

This descriptive study was carried out by using non probability consecutive sampling technique from June - December 2019 at the obstetrics and gynecological department of Bilawal Medical College Hospital Kotri

and Civil Hospital Karachi. After getting ethical approval from the ERC of Liaquat University of Medical and Health Sciences Jamshoro, informed consent was obtained from enrolled patients. The pregnant women with age between 18-50 years along with IDA (iron deficiency anemia) having hemoglobin level less than 10g/dl were included in this study and pregnant anemic patients having hemoglobin level greater than 10g/dl and normal iron level were excluded from this study. The CBC (complete blood count), Reticulocyte count, serum ferritin, TIBC (total iron binding capacity) parameters were measured twice on day 01 and after treatment on day 14.

Total Dose Infusion:

The calculation of total dose infusion was done by using standard Ganzoni's formula and customized for individual pregnant woman[11]. A test dose of 25 mg/ml iron dextran was administered to patients through intravenous (IV) injection initially, after infusing 25 ml of the dose first time; 15 minutes were required to observe the patient for any allergic reaction. After a 15 -minute observational period, the remaining of the dose was infused, the subsequent dose was managed by intravenous bolus rate of ≤50 mg/minute and diluted into normal saline up to 250ml to 1000ml and infused over one to six hours. We frequently managed a 1g (1000mg) dose of low molecular weight iron dextran; it was dissolved in 250 ml of 0.9% saline and administrated over one hour without any addition of medication[12]. The patients with more than one drug allergy or asthma a premedicated dose containing corticosteroids (125 mg methylprednisolone IV) was used

The collected data was analyzed through SPSS version 16. Mean, median and standard deviation were computed for selected quantitative variables including age, BMI and duration of disease. Frequency and percentages were calculated to determine the outcomes of therapy and compared the results with socioeconomic status of enrolled patient. The Chi-square test was applied to determine the significance of p value.

RESULTS

A total of 227 pregnant women with Iron deficiency anemia were included in this study. The age of 33% (74/227) patients ranged between 18-25 years in age, 36% (82/227) of patients were between 26-35 years in age and 31% (71/227) were above then 35 years. The median age of women was 28.64±5.07 and the median BMI was24. The socioeconomic status of the patients represented through pie-chart and bar- graph, the bar chart represents the majority of the patients were illiterate, 40.2%, and only 7.05% of participants pursued their higher secondary education and rest of patients were educated up to primary and the middle level **(Figure IA)**. The pie-chart showed that 65.20% of patients were poor economically and belonged to lower middle class families; whereas 71.72 % belonged to middle class and 3.08% belonged to upper middle class families **(Figure IB)**.

FIGURE IA: EDUCATIONAL STATUS OF ENROLLED PATIENTS

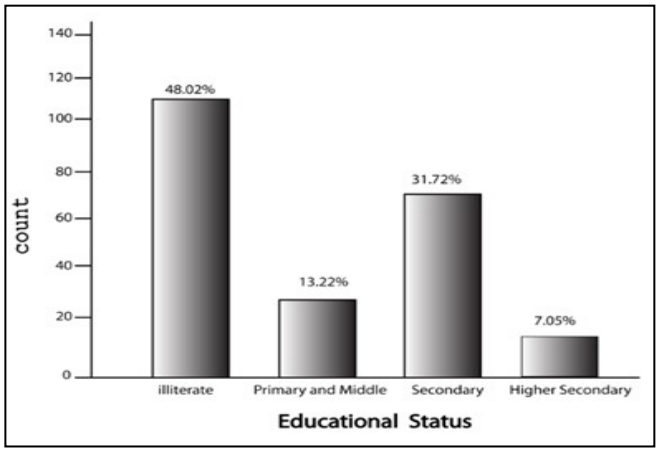
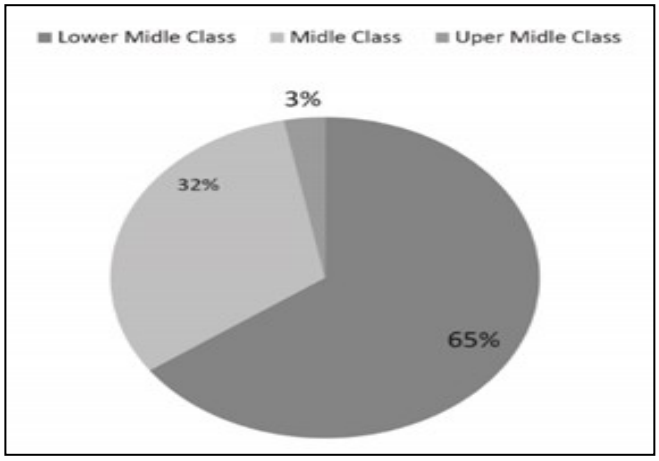


FIGURE IB:
ECONOMIC STATUS OF ENROLLED PATIENTS



The HB (hemoglobin), reticulocyte count, serum ferritin and TIBC (total iron-binding) capacity were measured before and after the intravenous iron therapy and followed the patients from day 1 to 14. The normal ranges of selected parameters including HB level were considered between (10.5 g/dl-14 g/dl), reticulocyte count level considered normal range between (0.2-2%), Serum ferritin normal range between (30-400 ug/ml) and total iron binding capacity normal range was considered between (250-400 ug/ml). The progressive output of therapy was seemed with in patients and positive results of selected parameters were achieved showed in **(Table I)**.

The positive outcome of total dose infusion in pregnant patients with iron deficiency anemia was observed in 80.62% (183/227) and in 20% (44/227) of patients the iron level was not increased and no positive response was observed. The quick positive outcome was recorded in the group of patients above

35 years 88.7% (63/71), but there is no significant difference recorded among the age group. The highest rate of a positive outcome of iron therapy, 84.4% (65/77) observed in healthy patients, who had mean BMI value 18 to 24.9 kg/m^2 and received less positive response in obese patients, while in overweight patients the outcome of therapy was 80.3% (94/117). It was observed that in the educated family the consistently increasing level of iron after treatment was higher than illiterate families. Moreover, the positive outcome was the highest in upper class families as compared to middle and lower class families. Further, the 80% of patents responded within 14 days of TDI whereas only 20% required more than 14 days for maintaining their hemoglobin level.

The dose of 25 mg intravenous iron dextran was required to increase the Hb level in anemic pregnant women and the calculated mean of hemoglobin was 10.26±1.04. In addition, it was observed that hemoglobin level increased fast in severe anemic pregnant women as compared to women with moderate anemia. The significant p values were obtained for the analysis of the socioeconomic status, age group weight and positive results of iron therapy described **(Table II)**.

TABLE-I: MEAN VALUES OF DIFFERENT VARIABLES BEFORE AND AFTER IRON DEXTRAN THERAPY

Variables	Before Therapy 1st day Mean	After Therapy 14 day Mean
Hb	8.105±1.06	10.26±1.04
Reticulocyte count	1.69±0.05	0.85±0.24
Serum ferritin	26.40±23.38	79.68±50.86
Total iron binding capacity	429.54±51.45	306.12±43

TABLE-II: OUTCOMES OF TOTAL DOSE INFUSION BY AGE, BMI AND SOCIOECONOMIC WISE

Variables	Outcome		P value
Age Group	**Positive response of patients within 15 days**	**Positive response of patients more than 15 days**	
18-25 years	78.4% (58/74)	21.6% (16/74)	0.103
26-35 years	75.6% (62/82)	24.4% (20/82)	
>35 years	88.7% (63/71)	11.3% (8/71)	
BMI (kg/m^2)			
18 to 24.9 kg/m^2	84.4% (65/77)	15.6% (12/77)	0.36
25 to 29.9 kg/m^2	80.3% (94/117)	19.7%(23/117)	
≤30 kg/m^2	72.7% (24/33)	27.3% (9/33)	
Educational Status			
Illiterate	77.1% (84/109)	22.9%(25/109)	0.08
Primary and Middle	73.3% (22/30)	26.7 %(8/30)	
Secondary	84.7%(61/30)	15.3%(11/72)	
Higher Secondary	100% (16/16)	0%	
Economic Status			
Lower middle class	80.4%(119/148)	19.6%(29/148)	0.41
Middle class	79.2% (57/72)	20.8%(15/72)	
Upper Middle class	100%(7/7)	0(0%)	

DISCUSSION

Iron deficiency Anemia is a common disorder and commonly found in women with gynecological complications. Iron deficiency is one of the most prevalent nutrient deficiencies worldwide, affected two billion populations across the globe[13]. Anemia has also been associated with the living standard of life of patients as well. The actual pathophysiology of anemia and associated factors is still not clear. The clinical studies have revealed that anemia may be managed successfully, if the timely decision is taken to manage the disease. Specifically, the anemia due to heavy uterine bleeding is controllable by the use of iron supplementation and therapy. The iron replacement therapy has been proved beneficial to maintain the healthy life of pregnant women but the variations in outcome due to different mode of administration of Iron has been debated. There are differences in terms of efficacy and safety of oral and intravenous iron supplements. Several studies have shown that intravenous treatment is rapid, secure and effective for the patients as compared to oral iron supplementation treatment[14,15]. This study was planned to analyze the outcome of TDI and the response to therapy was compared to selected demographics characteristics of the patients. Total dose infusion is mainly useful for providing care to patients, who prefer to maintain hemodialysis at home[16]. A multicenter randomized trial study showed that oral administration of iron is safe, effective and cost effective method[17].

In the present study total of 227 pregnant women with Iron deficiency anemia were included, and it was observed that the frequent cause of blood loss due to excessive menstrual bleeding is the prime cause of iron deficiency anemia (IDA) in pre-menopausal women. The second leading cause of IDA is gastrointestinal tract bleeding in post-menopausal women[18].

The previous study correlated the socioeconomic

status with iron deficiency anemia and revealed that the highest percentage of IDA was observed in the lower middle class families and lowest ratio was found in upper middle class families[19]. Our study suggested that upper middle class families also on the high risk of IDA as compare to middle and lower middle class families and also supports the previous study that socioeconomic status is not a cause factor for IDA in women who never get pregnant, but it is risk factor imposed by pregnancy when coupled with increased demands of iron[20].

This study showed a positive outcome of the total dose infusion in pregnant anemic patients of iron deficiency anemia in 88.7% (63/71) in age above 35 years and 100% in upper middle class and well educated women. The different cohorts of IDA were selected for TDI therapy and found the effective and positive results. The quick positive and effective response within day first and 10 were observed in upper middle class and educated families, TDI method was safe and non-inferior to oral Iron therapy in treating patients with iron deficiency, and resulted in a rapid hemoglobin increase and repletion of iron stores[21,22].

CONCULUSION

The study may help to provide a better understanding of the effectiveness of total dose infusion iron therapy in Pakistani anemic pregnant women. Moreover, the findings support the previous studies. The TDI treatment is in favor of pregnant women, because it is fast and quick for balancing the hemoglobin level and no significant toxicity was observed.

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AUTHOR CONTRIBUTIONS

Kanwal A: Monitoring patients' dose and Collection data
Nigar R: Analysis data and Writing
Phulpoto M: Monitoring patients' dose and Collection data
Waryah YM: Writing and critical review

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