

**Original Article**

**A PROSPECTIVE STUDY ON RISK FACTORS OF IRON DEFICIENCY ANEMIA IN PREGNANT WOMEN AND THEIR MANAGEMENT**

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**ABSTRACT**

**Objective:** Iron deficiency anemia during pregnancy leads to preterm birth, low birth weight and increases the incidence of postpartum hemorrhage (PPH) and the reason for the incidence of PPH is higher in India compared with the rest of the world. In this study, our main goal was to find out the risk factors and complications of iron deficiency anemia and their management in pregnant women.

**Methods:** It is a prospective study done at Obstetrics and Gynecology Department in Government District Headquarters Hospital, Tiruppur. All subjects were analyzed in full detail and hemoglobin estimation was also done to the patients.

**Results:** Study found that 52% shows moderate anemia followed by 30% mild and 18% severe, respectively. Risk factors are found in 55% cases. Study found an association between risk factors and severity of anemia.

**Conclusion:** Iron deficiency anemia continues to be the commonest etiology of anemia in pregnancy. The prevalence of iron deficiency in a pregnant woman is amongst the highest in the world. Untreated iron deficiency has significant adverse fetomaternal consequences. Iron supplementation and antenatal care are the basic requirements to prevent anemia.

**Keywords:** Anaemia, Hemoglobin, Risk factors, Pregnancy

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**INTRODUCTION**

Iron deficiency and its consequences continue to be prevalent in epidemic proportions despite major health reforms over the past century [1]. Anaemia can be defined by a condition in which the total hemoglobin (Hb) level or the number of red blood cells (RBCs) is poorly lowered. The World Health Organization (WHO) defines anemia as Hb<130 g/l in men older than 15 y, 110 g/l in pregnant women, and <120 g/l in non-pregnant women older than age 15 y [2]

Iron deficiency anaemia (IDA) is a certain anemic condition arising due to the inadequate iron to form normal RBCs. IDA is usually caused by insufficient iron intake, chronic blood loss, and increased iron demand [3]. Iron is an important dietary mineral associated with many body functions like oxygen transport in the blood. Iron deficiency anaemia is characterized by incomplete hemoglobin synthesis that results in microcytic and hypochromic red blood cells. Due to inadequate hemoglobin, the ability of blood to deliver oxygen to the other body cells and tissues is reduced. Iron deficiency is defined as an imbalance of iron intake, absorption and iron loss. The iron deficiency is the first cause of anemia [4-7].

**Causes of IDA in pregnancy women**

Regardless of the various aetiologies, most anaemic patients usually have some component of iron deficiency, which responds to iron administration. With the elderly, the aetiology is attributed to iron deficiency in approximately one-third and chronic renal disease or inflammation accounts to another one-third. The aetiology in the remaining group is often unclear [8]. Latrogenic anaemia or drug induced immune hemolytic anaemia (DIIHA) should be underscored with a growing list of commonly used medications being implicated [9].

**Prevalence of IDA in pregnancy**

Globally, the commonest cause for anemia in pregnancy is IDA. The Nutrition Impact Model Study, a systematic analysis of 257 population-representative data sources from 107 countries, estimated the global prevalence of anemia in pregnancy as 43% in

1995 and 38% in 2011 with the range varying from 17% in developed and 56.4% in developing countries. Etiology of anemia was attributed to ID in 50% of cases in this study [10]. The prevalence of occult ID in the absence of anemia is estimated to be between 30 and 60% in pregnant women [11]. In a population-based study from rural Haryana in 1994-1995, we had found 50% prevalence of anemia among non-pregnant women in the age group of 16-70 y [12]. Twenty years later, the prevalence of anemia still continues to be 53% in non-pregnant women and 50% in pregnant women as per population-based surveys of 2016 in our country [13]. As per the Global Nutrition Report 2016, India ranked miserably at 170th in terms of anemia prevalence in women [14].

**Risk factors of IDA in pregnancy**

Some major risk factors in IDA that includes the following such as having two closely spaced pregnancies and are pregnant with more than one baby, frequently vomiting due to morning sickness, lack of iron consumption in their diet and having a heavy pre-pregnancy menstrual flow with a history of anemia before pregnancy [15].

**Complications of IDA in pregnancy**

Anaemia during pregnancy is reported to have negative maternal and child health effects and increase the risk of maternal and perinatal mortality [16, 17]. The negative health effects for the mother include fatigue, poor work capacity, impaired immune function, increased risk of cardiac diseases, and mortality [16-18]. Some studies have shown that anaemia during pregnancy contributes to 23% of the indirect causes of maternal deaths in developing countries [18]. Anaemia in pregnancy is associated with increased risk of preterm birth and low birth weight babies [16].

**Diagnosing iron deficiency anemia in pregnancy**

Most guidelines recommend screening for anemia during pregnancy in the first trimester (or at booking) followed by 24 -28 w and at 36 w of gestation [19]. The cut-off values defined by WHO/CDC for anemia in pregnancy along with peripheral smear showing normal

morphology of RBC with central pallor have often been taken as criteria for flagging the physiologic anemia of pregnancy. A deviation from the above parameters should often be treated as pathologic and warrant further testing for the etiology and appropriate management of anemia during pregnancy [20].

#### Etiology of IDA in pregnancy

A history of pre-pregnancy menorrhagia, pre-pregnancy Hb, frequent childbirths, passage of worms and gastrointestinal blood loss should be taken in pregnant patients presenting with anemia. As the etiology of IDA in pregnancy often reflects a mismatch between the supply and demand of iron, we do not recommend stool testing

for occult blood, worm infestation, GI endoscopies or screening for celiac disease unless specifically indicated [21].

#### Treatment for iron deficiency anemia

##### Compulsory haemoglobin estimation

Compulsory Haemoglobin estimation by Cyanmeth-haemoglobin method by using Semi-autoanalyser or photo calorimeter at 14-16 w, 20-24 w, 26-30 w and 30-34 w of pregnancy for all pregnant mothers (minimum four Hb estimations). The interval between one haemoglobin estimation and another should have a minimum of four weeks.

**Table 1: Types of anemia and their level**

HB Level	Classification
<4g/dl	Very severe
4-6.9 g/dl	Severe
7-9.9 g/dl	Moderate
10-10.9 g/dl	Mild

#### Deworming at 14-16th week of gestation (Second trimester)

All pregnant women at 14-16th week during the second trimester should be given one tablet of Albendazole 400 mg–single dose.

##### I. At 14-16 w

First Hb estimation has to be done at 14-16th week for all the antenatal mothers

- If the Hb is more than 11 gms%, give prophylactic dose of IFA tablets
- If the Hb is 7.1-10.9 gms %, give therapeutic dose of IFA tablets
- If the Hb is less than 7 gms%, she has to be referred to CEmONC centers for Blood transfusion and further management.

Iron in the form of Ferrous Sulphate is the best choice. Preventive/therapeutic form of oral iron therapy should be started after deworming.

Prophylactic dose: Tab. IFA (100 mg. of iron with 0.5 mg of folic acid) once daily for 100 d.

Therapeutic dosage: Tab. IFA twice daily for 100 d

##### II. At 20-24 w

Second, Haemoglobin estimation has to be done between 20 and 24 w of gestation for all AN mothers.

- If the Hb is more than 11 gms, give a prophylactic dose of IFA tablets.-

- If the Hb is 9-10.9 gms%, give therapeutic dose of IFA tablets.

- If haemoglobin level is between 7.1 to 8.9 gm/dl. IV Iron sucrose infusion has to be given.

Intravenous infusion of Iron sucrose–100 mg. in 100 ml of Normal saline infused over 20-30 min once a day x 4 d over a period of 2 w (with 2-4 d of interval between each infusion)

$\frac{3}{4}$  Discontinue oral iron therapy while IV iron sucrose infusion till next Hb estimation and decision (after 4 w of Iron sucrose infusion). Vitamin supplementation need not be withheld.

- If the Hb is less than 7 gms %, she has to be referred to CEmONC centres for Blood transfusion and further management.

#### Oral iron therapy

Practically all medicinal iron preparations contain ferrous compounds. Ferrous fumarate, gluconate and sulfate are commonly used. Other ferrous compounds previously or still in use include ferrous succinate, lactate, glycine sulfate, glutamate, citrate, tartrate and pyrophosphate. Although ferrous succinate is probably more completely absorbed, these compounds, in addition to being more expensive, offer no advantages over ferrous fumarate, gluconate or sulfate. Iron deficiency anaemia Iron tablets contain a percentage of elemental iron that varies with the molecular weight of the iron compounds [22].

**Table 2: List of oral ferrous compounds**

Preparation	Iron compound (mg) per tablet	Elemental iron(mg) per tablet	% of Iron
Ferrous fumarate	200	66	33
Ferro-us gluconate	300	36	12
Ferrous sulfate	300	60	20
Ferrous sulfate, anhydrous	200	74	37
Ferrous sulfate, exsiccated	200	60	30

#### Parenteral iron therapy

##### Intramuscular (IM) iron

The Ministry of Health and Family Welfare (MoHFW) guidelines for the treatment of IDA in pregnancy continue to recommend IM iron following a test dose as a cost-effective treatment for moderate anemia in pregnancy [23]. However, the intramuscular route has essentially been replaced by intravenous route because of the inconvenience of painful injection, dark discoloration of the skin, and the risk of myalgias, arthritis, hypersensitivity, lymphadenopathy at most centers [24]. Moreover, there is

increased risk of development of sarcoma at the site of injection in treated animals [25]. Low molecular weight iron dextran is the only preparation which can be recommended for intramuscular use in primary care settings with a Z technique if resuscitation facilities are available [23].

##### Intravenous iron

Intravenous (IV) iron combines the advantages of complete bioavailability with fewer GI side effects and faster recovery of Hb than oral iron. However, the increased risk of oxidant damage, increased cost and small but finite risk of hypersensitivity reaction

limit the widespread use of IV iron [26]. The odds ratio/overall risk (OR) of reported total absolute rates of life-threatening adverse events with parenteral iron is 38 per million doses, predominantly with high molecular weight iron dextran [27]. Thus, while the use of high-molecular iron dextran is no longer justified, numerous other iron preparations have been proven to be safe in pregnancy. One of the previous disadvantages of IV iron was the requirement of multiple infusions. This has been circumvented by the newer preparations like iron-isomaltoside and iron carboxymaltose which allow larger infusion doses of elemental iron to be administered over a short period of time [28, 29].

#### MATERIALS AND METHODS

This prospective study was done among 100 pregnant women who were found to be anemic visited at Department of Obstetrics and Gynecology in Government District Headquarters Hospital,

Tiruppur. Data collection was done after ethical permission from the institutional ethical committee and informed consent of clients.

All subjects were analyzed in full details and hemoglobin estimation done during 1<sup>st</sup> visit, at 30<sup>th</sup> week and 36<sup>th</sup> week of gestation. Blood cultures were done in all the babies admitted to NICU for various reasons. Pre-tested questionnaire was administered and details like socio demographic information, past history of medical illness, menstrual history was collected

#### RESULTS

Socioeconomic status of the study participants was analysed. Considering the age group, anemia was found more between 20 to 24 y of age. About 80% observed in lower socio-economic status. Multi gravida was observed in about 68% of patients and 58% of patients were pregnant with less than 2 y of previous pregnancy. Risk factors are found in 55% of cases.

Table 3: Clinico-social information of study participants (N=100)

Variable	Numbers (%)
<b>Age (in year)</b>	
<19	12
20-24	46
25-29	22
>30	20
<b>Socio-economic status</b>	
Lower	80
Middle	20
<b>Literacy status</b>	
Illiterate	25
Primary	40
Secondary	20
Graduate	15
<b>Parity</b>	
Primigravida	32
Multigravida	68
<b>Spacing between pregnancy (in year)</b>	(n=100)
<2	58
>2	42
<b>Risk factor</b>	
Present	55
Absent	45
<b>Degree of anaemia</b>	
Mild	30
Moderate	52
Severe	18
<b>Mode of delivery</b>	
Vaginal	65
LSCS	35

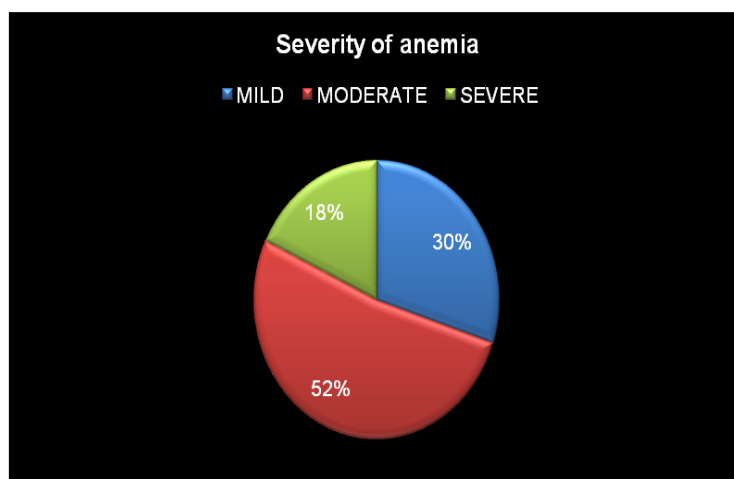


Fig. 1: Shows degree of anemia in patients.18% shows severe anaemia, 52% moderate anemia and 30% showing mild anemia

Table 4: Association of socio clinical characteristics with severity of Anemia

Variable severity of anaemia	Mild	Moderate	Severe
<b>Age</b>			
<19	5	4	2
20-24	17	25	6
25-29	5	20	8
>30	1	6	1
<b>Literacy</b>			
Illiterate	4	24	11
Primary	15	15	3
Secondary	9	9	3
Graduate and above	2	3	2
<b>Socio-economic status</b>			
Lower	23	43	15
Middle	6	9	4
<b>Gravida</b>			
Primigravida	15	15	4
Multigravida	15	37	14
<b>Mode of delivery</b>			
Vaginal	21	41	4
LSCS	9	11	14
<b>Risk factor</b>			
PE	4	14	13
PROM	17	16	10
Rh-ve	1	4	2
Hypothyroidism	2	3	4
Placenta PRV	0	1	4
Abruptio placenta	1	1	0
GHTN	0	2	1
<b>Space between pregnancy</b>			
<2	7	23	11
>2	17	28	14
<b>Birth weight</b>			
<2.5	24	42	13
>2.5	5	11	5

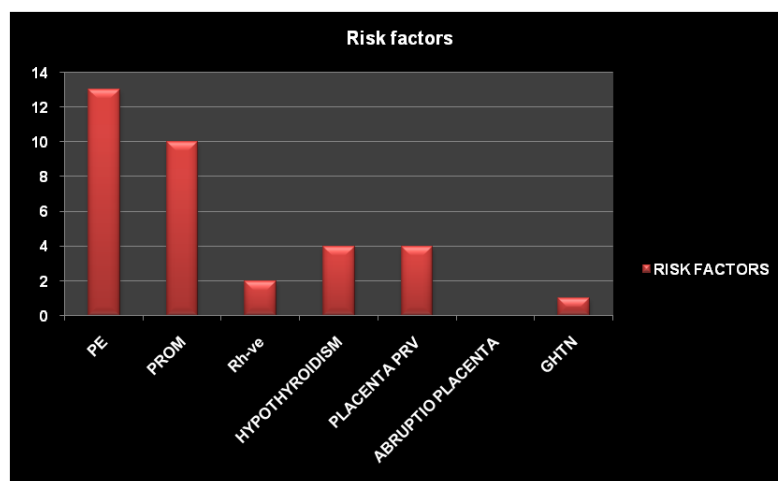


Fig. 2: Shows various risk factors and their association with severe anemia

Table 5: Administration of intravenous iron therapy (n=30)

Drug	Dose	Number of patients
Iron sucrose	100 mg/5 ml	12
Iron carboxymaltose	500 mg/10 ml	18

Table 6: Administration of oral iron therapy (n=70)

Drug	Dose	No of patients
Ferrous sulphate	200 mg	24
Ferrous fumarate	200 mg	16
Ferrous gluconate	300 mg	30

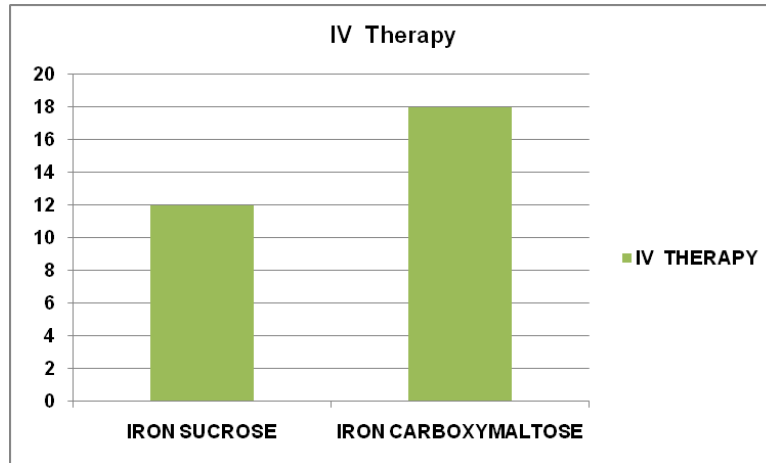


Fig. 3: Administering iron sucrose to 12 patients and iron carboxy maltose to 18 patients

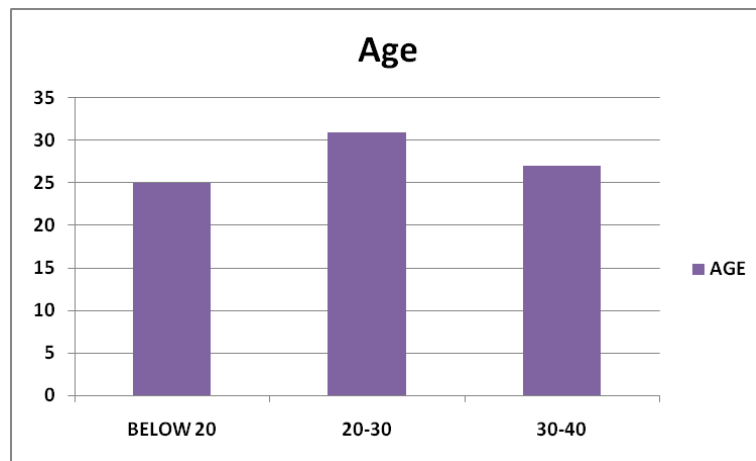


Fig. 4: Administering IV to different age categories

Table 7: Age categorisation of patients

Age	Number of patients
Below 20	25
20-30	31
30-40	27
Above 40	17

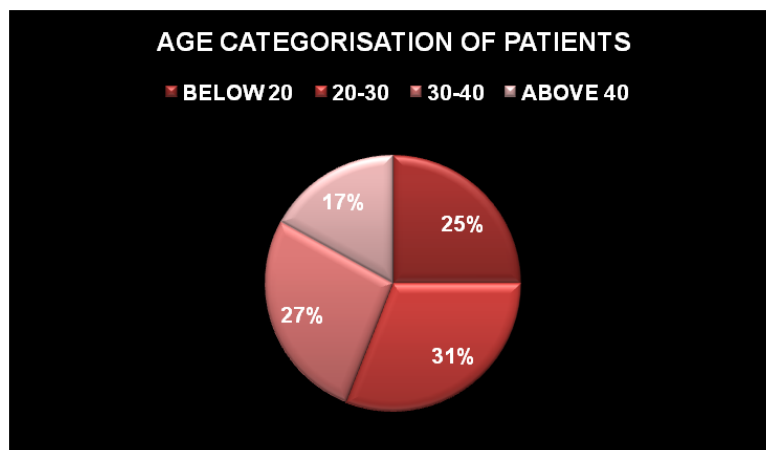


Fig. 5: Different age categorization patients

**DISCUSSION**

Table 1: shows the clinic-social information of study participants. Most participants (46%) belonged to 20-24 y age group followed by 22% in 25-29 y and 12% in less than 19 y, respectively. Socio-economic status is divided in two categories. Almost 80% participants were in lower classes. Around 40% participants were studied up to primary level followed by illiterate (25%), secondary level (20%) and graduation (15%). Almost 68% cases were multigravida and 58% cases pregnant within less than 2 y of previous pregnancy. Present study observe pregnancy related risk factor like PE, PROM, Rh-ve, hypothyroidism, placenta Previa, GHTN, Abruptio placenta. Risk factors present in 55% cases.

Table 2: shows that severe and moderate anemia seen more among age group of 25 to 29 and 20 to 24 y respectively.

Severe and moderate anemia seen more among illiterate participants and less among literate participants. Anemia is more seen among participants of lower socio-economic class. Multigravida participants are showing more number of moderate and severe anaemia cases than primigravida participants. LSCS observed more among participants with severe anaemia.

Risk factor with severity of anemia was studied and it shows that majority of participants with severe anemia had preeclampsia followed by premature rupture of membrane. Minor risk factor developed in this study is Rh-ve 13 participants with severe anemia and 42 participants with moderate anemia shows low birth weight of less than 2.5 kg.

**CONCLUSION**

Iron deficiency anemia continues to be the commonest etiology of anemia in pregnancy. The prevalence of iron deficiency in pregnant woman is amongst the highest in the world. Untreated iron deficiency has significant adverse feto-maternal consequences. Iron supplementation and antenatal care are the basic requirements to prevent anemia.

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Nil

**AUTHORS CONTRIBUTIONS**

All the authors have contributed equally.

**CONFLICT OF INTERESTS**

Declared none

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