

## **Study of Maternal and Perinatal outcome in moderate to severe degree iron deficiency anaemia in rural community**

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### **Abstract**

**Background:** Anaemia is the commonest medical disorder associated with pregnancy. It contributes to one fifth of the maternal deaths and large number of preterm deliveries and low birth weight babies in India.

**Objectives:** To study maternal and perinatal outcome in pregnancies complicated by anaemia.

**Setting-** Tertiary care teaching hospital in central India.

**Study Design:** Prospective observational study.

**Material and Methods:** Study was conducted for a period of two years from September 2012 to August 2014. A total of 1644 pregnant women were screened for evidence of iron deficiency anaemia. Maternal and perinatal outcome of women with moderate to severe anaemia was analyzed.

**Statistical analysis:** was done by finding out percentages, proportions, Mean and Standard deviation (SD), Chi square test.

**Results:** Prevalence of anaemia among pregnant women was 49.40%. Mild, moderate and severe degree of anaemia was seen in 19.46%, 25.06% and 04.86% cases respectively. The incidence of preterm delivery and low birth weight babies was two times more than women with normal haemoglobin values. The perinatal mortality and morbidity among babies born to anaemic women was high. There was no maternal mortality in the present study.

**Conclusion:** The study revealed that anaemic women are more prone for life threatening obstetric and medical complications, preterm labour, low birth weight babies and perinatal morbidity and mortality., Strengthening the peripheral health care delivery system, regular antenatal care, high risk pregnancy identification, oral and parenteral iron therapy and institutional deliveries can reduce the incidence of anaemia and the resultant morbidity and mortality.

**Keywords:** Anaemia in pregnancy, Maternal morbidity, Maternal mortality, Perinatal outcome.

### **1. Introduction**

Anaemia is the most common nutritional deficiency disorder in the world. WHO has estimated that prevalence of anaemia in developed countries is 14 % and 51% in developing countries among pregnant population. Prevalence of anaemia in South Asian countries is among the highest in the world. WHO estimates that even among the South Asian countries, India has the highest prevalence of anaemia. Women of child bearing age are at the maximum risk for development of anaemia. Prevalence of anaemia in India is 65-75% in pregnant women.[1]

Anaemia is defined by WHO as Haemoglobin (Hb) less than 11gm% in pregnancy, and is divided into three degrees mild (10 -10.99 gm %), moderate (7.0-9.9 gm %) and severe degree (<7.0 gm %).[2] Most of the studies have demonstrated a strong association between maternal anaemia

and adverse outcome such as low birth weight, preterm delivery and intrauterine growth retardation.[3-7] Iron deficiency anaemia is an important public health problem for pregnant women, living in developing countries, affecting 2/3rd of pregnant women and contributes to maternal morbidity and mortality and to low birth weight.[8-9]

Iron deficiency (IDA) is the most common and primary cause of anaemia. IDA prevalence indicates the nutritional status of a community. Considering the effects of IDA on maternal and fetal mortalities, physical function and child growth and development, it is regarded as one of the main health indicators.[10] High prevalence is directly associated with poor health status, poverty, poor socioeconomic status, multiparity, less birth spacing. Iron deficiency during pregnancy is thought to be caused by combination of factors such as previously decreased iron

supply, the iron requirements of growing fetus and expansion of maternal plasma volume. [11] What is even more important is the fact that about half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80 per cent of the maternal deaths due to anaemia in South Asia.[12]

### 1.1 Aims and Objectives

- 1) To analyze maternal outcome in pregnancies complicated by anaemia
- 2) To analyze perinatal outcome in pregnancies complicated by anaemia

## 2. Material and Methods

**2.1 Type of study:** Prospective Observational Study

**2.2 Place of study:** Department of Obstetrics and Gynaecology, Rural Medical College, Loni, Ahmednagar, Maharashtra.

**2.3 Duration of study:** Two years

**2.4 Period of study:** 1<sup>st</sup> September 2012 to 31<sup>st</sup> August 2014

**2.5 Study population:** Pregnant women reporting to antenatal clinic or admitted to Pravara Rural hospital for treatment or delivery.

**2.6 Number of subjects** – 1644

### 2.7 Inclusion criteria:

- a) Pregnant women in third trimester of pregnancy.
- b) Moderate (Hb: 7 – 9.9 g/dl) to Severe degree (Hb :< 7 g/dl) of anaemia.
- c) Blood indices and peripheral smear suggestive of iron deficiency anaemia

### 2.8 Exclusion criteria

- a) Anaemia due to acute blood loss.
- b) Hemolytic anaemia.
- c) Anaemia cases with other medical and obstetrical complications like pre eclampsia, eclampsia, diabetes, urinary tract infections, thyroid disease, antepartum haemorrhage, heart disease, multi-fetal pregnancy, Immuno deficiency state.
- d) Anaemia cases that subsequently did not deliver at Pravara Rural Hospital or were lost to follow up after initial investigations and treatment.

### 2.9 Methodology

One thousand six hundred and forty four pregnant women coming to antenatal clinic in third trimester onwards were subjected to haemoglobin estimation. Pregnant women who were diagnosed to have moderate to severe degree of anaemia as per WHO criteria in outpatient department were advised about the need for admission in the ward for detailed evaluation and treatment. Detailed medical and obstetrical history was obtained to find out the possible cause of anaemia. Haematological and other investigations were performed to know the degree and type of anaemia. Haemoglobin level was estimated by Automated Hematology Analyzer (SYSMEX) which uses the non-cyanide haemoglobin analysis method. Typing of anaemia was done as per standard peripheral blood smear examination method. Anaemia was classified according to WHO criteria, in which haemoglobin below 11 g/dl was considered as cut off value to

label anaemia. It was further classified as mild (10-10.9g/dl), moderate (7-9.9g/dl) and severe (<7g/dl) anaemia. Discussion with each mother about the possible cause of anaemia, importance of regular intake of iron tablets, correction of faulty dietary practices was conducted. Cases that fulfilled the selection criteria were enrolled as the study subjects. Informed written consent was obtained from all study subjects in local language.

### 2.10 Data collection

A pilot study was conducted with the pre-designed proforma and necessary modifications were made in the proforma after pilot study. Pregnant women were interviewed with the pretested proforma. Information regarding investigations performed, treatment given and maternal and perinatal outcome was entered in pretested structured proforma.

### 2.11 Data compilation

The data collected from screening of 1644 pregnant women for anaemia and the maternal and perinatal outcome in anaemic women was collected and then entered in a master chart.

### 2.12 Data analysis

Descriptive statistics were computed by finding percentages and proportions, Mean and Standard deviation (SD). Group comparisons were done by Chi square test. P values less than 0.05 were considered statistically significant.

## 3. Results

Total of 1644 pregnant women were screened for anaemia by haemoglobin estimation on OPD/indoor basis. WHO guidelines were used for classification for anaemia. Pregnant women with haemoglobin level below 11 grams /dl were considered as anaemic. It was observed that 832 women (50.60%) had normal haemoglobin level, 320 women (19.46%) had mild degree of anaemia, 412 women (25.06%) had moderate degree of anaemia and 80 women (04.86%) had severe degree of anaemia.

The prevalence of anaemia in the study population was 49.40%. All pregnant women with normal haemoglobin level and those having mild anaemia were advised to take oral iron therapy. Women with moderate and severe anaemia received parenteral iron therapy and blood transfusion respectively.

It was observed that consumption of oral iron was inconsistent among pregnant women. Many women discontinued oral iron due to upper gastro intestinal side effects like nausea, vomiting, anorexia and constipation or diarrhoea. Some women did not have regular access to iron tablets due to geographic locations of the government health centres. Many women were not in a position to purchase iron tablets from the market due to financial reasons. Many illiterate women had a wrong notion that consumption of iron tablets results into large babies which interferes with the process of normal labour.

Majority of women who required parenteral iron therapy for treatment of moderate degree of anaemia were not in a position to purchase the drug due to cost factor. Many of them purchased one or two doses and then conveyed inability to purchase the drug due to cost factor. None of the woman who received intravenous iron had any drug related reaction. Blood transfusion was advocated for women with severe anaemia in later weeks of pregnancy or for those who had reported in labour.

Pregnant women were reluctant to stay in hospital for longer period as it affected their house hold chores and daily wages. Women did not understand the importance of iron intake due to low educational status and ignorance. For above mentioned reasons, approximately 20% women with moderate degree of iron deficiency remained anaemic even at the time of labour. The overall compliance of women with severe degree of anaemia was much better than moderate variety.

**Table 1: Distribution of anaemia cases as per severity**

Sr. No	Severity of Anaemia	No. of Cases (N=150)
1.	Moderate (7 – 9.9 gm/dl)	76 (50.66%)
2.	Severe (<7 gm/dl)	74 (50.44%)

Out of 150 cases of anaemia in the study population, almost equal number belonged to moderate (76 cases) and severe (74 cases) variety

**Table 2: Distribution of anaemia cases as per mode of delivery**

Sr. No	Mode of Delivery	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	Spontaneous Vaginal	49 (64.47%)	52 (70.27%)	101(67.33%)
2.	Instrumental	13 (17.10%)	09 (12.16%)	22 (14.66%)
3.	Caesarean Section	14 (18.43%)	13 (17.56%)	27 (18.00%)

Eighty two percent anaemic women had vaginal delivery out of which fifteen percent had instrumental delivery. Eighteen percent women were delivered by lower segment caesarean section. The severity of anaemia had no major influence on the incidence of different modes of deliveries.

**Table 3: Distribution of cases as per indication of caesarean section and instrumental deliveries**

Sr. No	Indication for operative delivery	LSCS. No (%) (N=27)	Instrumental Delivery No (%) (N=22)
1	Foetal Distress	07 (25.92%)	11 (50.00%)
2	Failed induction	02 (07.40%)	-
3	Arrest of dilatation	02 (07.40%)	-
4	Occipito posterior	02 (07.40%)	01 (04.54%)
5	Malpresentations	02 (07.40%)	-
6	IUGR	04 (14.81%)	02 (09.09%)
7	Cephalo pelvic disproportion	03 (11.11%)	-
8	Maternal exhaustion / Poor maternal bearing down	-	06 (27.27%)
9	Maternal Request	02 (07.40%)	-
10	Previous caesarean section	03 (11.11%)	01 (04.54%)
11	Rigid perineum / Prolonged second stage	-	01 (04.54%)

Foetal distress, cephalo-pelvic disproportion, intrauterine growth restriction and previous caesarean

delivery were common indications for caesarean section, where as fetal distress and maternal exhaustion with resultant poor bearing down were common indications for instrumental deliveries.

**Table 4: Distribution of newborn babies as per gestational age**

S. No	Gestational Age	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	Below 37 weeks	31 (40.78%)	37 (50.00%)	68 (45.33%)
2.	37-40 weeks	33 (43.44%)	31 (41.90%)	64 (42.66%)
3.	Above 40 weeks	12 (15.78%)	06 (08.10%)	18 (12.00%)

The overall incidence of preterm delivery was 45% in the anaemic women. The incidence was slightly more in women with severe anaemia (50%).

**Table 5: Distribution of newborn babies as per birth weight**

S. No	Birth Weight of babies (gms)	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	< 1000	0	0	0
2.	1000 – 1500	08 (10.52%)	13 (17.57%)	21 (14.00%)
3.	1501 – 2000	19 (25.00%)	27 (36.48%)	46 (30.66%)
4.	2001 – 2500	28 (36.84%)	21 (28.38%)	49 (32.66%)
5.	> 2500	21 (27.63%)	13 (17.57%)	34 (22.66%)

Value of Chi square test 7.799, p = 0.0124, Significant. The overall incidence of low birth weight (below 2500gms) was 77% and the incidence of very low birth weight (below 1500gms) was 14%. The incidence low birth weight increased as the severity of anaemia increased. .By applying the Chi Square test there is a significant association between birth weight of babies and anaemia (p = 0.0124)

**Table 6: Maternal morbidity in moderate and severe anaemia**

Sr. No	Morbidity	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	Intra-partum Maternal exhaustion	16(21.05%)	22 (29.72%)	38 (25.33%)
2.	Prolonged 2 <sup>nd</sup> Stage	15(19.73%)	12 (16.21%)	27 (18.00%)
3.	PPH requiring blood transfusion	04(05.26%)	05 (06.75%)	09 (06.00%)
4.	Puerperal Sepsis /Episiotomy site infection	02(02.63%)	03 (04.05%)	05 (03.33%)
5.	Puerperal Febrile illness	08(10.52%)	12 (16.21%)	20 (13.33%)
6.	Thrombo-embolism	0	01 (01.35%)	01 (00.66%)
7.	Inadequate Lactation	12(15.78%)	15 (20.27%)	27 (18.00%)
8.	Surgical site infection	03(03.94%)	04 (05.40%)	07 (04.66%)
9.	Surgical wound dehiscence	05(06.57)	06 (08.10%)	11 (07.33%)

Maternal exhaustion and prolonged second stage of labour were common complications during intra-partum period, where as puerperal febrile illness, inadequate lactation and surgical site infections were common complications during postpartum period in women with moderate and severe anaemia.

**Table 7: Distribution of perinatal deaths in relation to severity of anaemia**

Sr. No	Time of Death	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	Antepartum (IUD)	03 (03.94%)	04 (05.40%)	07 (04.66%)
2.	Intrapartum (FSB)	0	1 (01.35%)	01 (00.66%)
3.	Neonatal deaths (NND)	02 (02.63%)	04 (05.40%)	06 (04.00%)

There were 14 perinatal deaths in the study group of 150 pregnant anaemic women. Seven babies died in utero during pregnancy resulting in macerated stillbirths, where as there was one intra-partum death and six neonatal deaths due to various reasons.

**Table 8: Distribution of perinatal deaths as per aetiology**

Sr. No	Aetiology	IUD (N=7)	FSB (N=1)	NND (N=06)	Total (N=14)
1.	Very Low Birth Weight with RDS	0	0	02 (33.33%)	02 (14.28%)
2.	Severe birth asphyxia	0	01 (100.00%)	01 (16.66%)	02 (14.2%)
4.	Neonatal Sepsis	0	0	01 (16.66%)	01 (07.14%)
5.	Meconium Aspiration	0	0	01 (16.66%)	01 (07.14%)
6.	IVH/DIC/Prematurity	0	0	01 (16.66%)	01 (07.14%)
7.	Severe IUGR	05 (71.43%)	0	0	05 (35.71%)
8.	Multiple congenital anomalies	02 (28.57%)	0	0	02 (14.28%)

Majority of perinatal deaths were result of extreme prematurity, respiratory distress syndrome, very low birth weight, birth asphyxia and intra uterine growth restriction.

**Table 9: Distribution of cases of neonatal morbidity as per aetiology**

Sr. No	Neonatal Morbidity	Moderate Anaemia (N=76)	Severe Anaemia (N=74)	Total (N=150)
1.	Hyperbilirubinaemia requiring phototherapy	15 (19.73%)	12 (16.21%)	27 (18.00%)
2.	Neonatal Sepsis	05 (06.57%)	04 (05.40%)	09 (06.00%)
3.	DIC	02 (02.63%)	05 (06.75%)	07 (04.66%)
4.	RDS	05 (06.57%)	08 (10.81%)	13 (08.66%)
5.	IVH	02 (02.63%)	03 (04.05%)	05 (03.33%)
6.	NICU Admission	16 (21.05%)	20 (27.02%)	36 (24.00%)
7.	Blood transfusion	02 (02.63%)	05 (06.75%)	07 (04.66%)
8.	Congenital Pneumonia	01 (01.31%)	01 (01.35%)	02 (01.33%)
9.	Oral thrush	02 (02.63%)	02 (02.70%)	04 (02.66%)
10.	Neonatal Seizures	03 (03.94%)	04 (05.40%)	07 (04.66%)

Hyper-bilirubinaemia, respiratory distress syndrome, neonatal sepsis, disseminated intravascular coagulation and

neonatal seizures were the common problems faced by newborn babies of anaemic mothers. Many babies required prolonged stay in neonatal care unit and blood transfusion for various reasons. The complication rate was more in babies of severely anaemic women as compared to babies of women with moderate anaemia.

## 4. Discussion

### 4.1 Mode of delivery

Out of 150 cases of moderate to severe anaemia in pregnancy, 67.33% cases delivered spontaneously by vaginal route, 14.66% by instrumental delivery and 18% by caesarean section. All caesarean section cases were given average two units of blood transfusion during peri-operative period. The severity of anaemia had no influence on the mode of delivery in the present study.

Common indications for caesarean section were fetal distress (25.92%), Intrauterine growth restriction (14.81%), Previous caesarean section (11.11%), Cephalo pelvic disproportion (11.11%) and Mal-presentations (07.40%). All caesarean sections were performed for obstetric indications. The common indications for instrumental deliveries were fetal distress and maternal exhaustion causing prolonged second stage. Maternal exhaustion was related to anaemic status of the women. Ventouse deliveries were performed in 11(50%) cases and outlet forceps were performed in 11 cases (50%) for cases of fetal distress.

### 4.2 Preterm delivery

Anaemia in pregnancy affects the perinatal outcome adversely. The literature search has shown that the incidences of prematurity and low birth weight are high in pregnant women with anaemia. In the present study, the incidence of premature births in anaemic cases was 45.33%, which was twice the incidence in women without anaemia as per the hospital records. Majority of the perinatal problems in anaemic woman were related to prematurity. The incidence of post dated pregnancy was 12% in anaemic women.

Welsh women who were first diagnosed with anaemia (haemoglobin <104 g/L) at 13–24 weeks of gestation had a 1.18–1.75-fold higher relative risk of preterm birth, low birth weight, and perinatal mortality.[13] After controlling for many other variables in a large Californian study, Klebanoff *et al* [14] showed a doubled risk of preterm delivery with anaemia during the second trimester but not during the third trimester. [14]

### 4.3 Maternal Anaemia and Birth weight

In the present study, the incidence of low birth weight babies and very low birth weight babies was 77.33% and 14% respectively. There was no co-relationship between severity of anaemia and incidence of low birth weight. The overall incidence of low birth weight in the study group was double the incidence low birth weight in women with normal haemoglobin status as per hospital records. Similar observations have been reported by other researchers. Lower

birth weights in anaemic women have been reported in several studies.[15-17] In a multivariate regression analysis of data from 691 women in rural Nepal, adjusted decrements in neonatal weight of 38, 91, 187, and 153 g were associated with haemoglobin concentrations  $\geq 20$  90–109, 70–89 and  $< 70$  g/L, respectively.

A significant fall in birth weight due to increase in prematurity rate and intrauterine growth retardation has been reported when maternal haemoglobin levels were below 8.0 g/dl.[18-19] Lastly, maternal infections – the likelihood of which increases with iron deficiency – can prompt the production of corticotropin-releasing hormone; again, the production of cortisol could have a negative effect on fetal growth. [20]

#### 4.4 Maternal morbidity

Maternal anaemia is considered as one of the serious risk factors during pregnancy. Anaemic women are prone for development of complications during pregnancy, labour and in puerperium. The risk of complications is related to severity of anaemia. In the present study, it was observed that 25.33% women experienced intrapartum exhaustion and 18% developed prolonged second stage due to maternal exhaustion and inadequate uterine contractions. Six percent women developed atonic postpartum haemorrhage, which was managed by oxytocic drugs and blood transfusion. Febrile morbidity was noted in 13.33 percent women during early puerperium. Infective morbidity was seen in the form of puerperal sepsis and episiotomy site infection in 03.33% cases and caesarean wound infection and dehiscence in 04.66% and 07.33% respectively. Inappropriate lactation was noted in 18% women. The problem was more evident in women with low body mass index, those who had postpartum haemorrhage, with history of prolonged labour and operative delivery. One woman developed deep vein thrombosis of lower limb. She had undergone caesarean section for prolonged second stage. She was treated with low molecular weight heparin and other conservative measures. Increased maternal morbidity resulted in increased hospital stay of women following delivery or caesarean section.

Although anaemia is a known direct and indirect cause of maternal mortality, there was no maternal mortality due to anaemia in the present study. This could be due to prompt treatment of severe anaemia by blood transfusion or by early recognition and prompt management of complications of severe anaemia like cardiac failure or pulmonary edema in intensive care unit with the help of physician.

#### 4.5 Perinatal morbidity and mortality

Moderate to severe anaemia during pregnancy is known to be responsible for adverse perinatal outcome. In the present study, there were 14 perinatal deaths among 150 deliveries of which 7 were intrauterine deaths (IUD-Macerated deaths), 1 was intrapartum deaths (Fresh stillbirth) and remaining 6 were neonatal deaths. The numbers of

perinatal deaths among severely anaemic women were two times more than the deaths in women with moderate anaemia. The main causes for intrauterine deaths were severe intrauterine growth restriction in 5 cases. Two babies had multiple congenital malformations. One baby died intrapartum due to severe birth asphyxia. Two babies died in early neonatal period due to complications of very low birth weight with respiratory distress syndrome. One baby each died due to severe birth asphyxia, neonatal sepsis, meconium aspiration and intra-ventricular haemorrhage due to prematurity.

In addition to the perinatal mortality, some babies developed complications in the neonatal period. Twenty one percent neonates required admission in neonatal care unit. Hyper-bilirubinaemia was observed in 18% neonates and that was treated by phototherapy. Respiratory distress syndrome, neonatal sepsis, disseminated intravascular coagulation and neonatal seizures were seen in babies of anaemic mothers. In 24.00 % babies had prolonged hospital stay in neonatal care unit. Babies with anaemia, internal haemorrhage due to acquired coagulopathy and sepsis required blood transfusion.

Overall complication rate was proportionate with the severity of anaemia. Severe anaemia in pregnancy impairs oxygen delivery to the foetus and interferes with normal intra-uterine growth, resulting in intrauterine growth retardation, stillbirth, LBW and neonatal deaths. Therefore, anaemia is a major contributor to poor pregnancy and birth outcomes in developing countries as it predisposes to premature delivery, increased perinatal mortality and increased risk of death during delivery and postpartum. Most of the studies suggest that a fall in maternal haemoglobin below 11.0 g/dl is associated with a significant rise in perinatal mortality rate.[21-23]

There is usually a 2 to 3-fold increase in perinatal mortality rate when maternal haemoglobin levels fall below 8.0 g/dl and 8-10 fold increase when maternal haemoglobin levels fall below 5.0 g/dl.[18-19] A significant fall in birth weight due to increase in prematurity rate and intrauterine growth retardation has been reported when maternal haemoglobin levels were below 8.0 g/dl.[18-19]

## 5. Conclusion

Anaemia in pregnancy is one the major public health problems in the developing and underdeveloped world. The problem is related to various adverse socio demographic determinants still prevailing in this part of the world .Anaemia has serious consequences on maternal and child health, when not recognized or treated. Study revealed adverse maternal and perinatal outcome in moderate to severe iron deficiency anaemia. It can be prevented by improving the awareness of community about the magnitude of the problem, nutritional advise and supplementation, oral and parenteral iron therapy and institutional deliveries to avoid the complication of severe anaemia quality.

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