



## Impact Of Maternal Anemia On Maternal And Neonatal Outcome – A Prospective Observational Study

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### Abstract

Background: Anaemia in pregnancy is highly prevalent, especially in developing countries. The most common cause is nutritional deficiency.

It is associated with adverse outcomes, both in the mother and the foetus.

Objective: The objective of our study was to study the impact of maternal anaemia on maternal and foetal outcomes, and various complications associated with it.

Methodology: We conducted a prospective study over a period of one year. All pregnant women delivering in JSS Hospital, Mysore, during the study period were included. The prevalence of anemia in pregnancy, and the maternal and fetal outcomes were documented.

Results: The data was analyzed using MS Excel and R-4.0.5 software. The prevalence of anemia in pregnancy in our study was determined to be 58.5%. A strong association was found between the severity of anemia and various maternal and fetal complications.

Conclusion: Various health care measures need to be implicated for the prevention, detection and management of anemia in pregnancy.

**Keywords:** Anemia, pregnancy, blood transfusion, maternal morbidity, perinatal morbidity

### Introduction

Anemia is one of the most common nutritional disorders seen in pregnancy, especially in women of developing countries. The prevalence of anemia in pregnancy, varies from 14% in developed countries to more than 50% in developing countries.<sup>1</sup> In India, prevalence of anemia in pregnancy has been reported between 65 – 75%.<sup>2</sup> WHO defines the cut off value for anemia on pregnancy as Hemoglobin of <11 gm%.<sup>3</sup>

Moderate to severe anemia is associated with various maternal and perinatal complications, such as: lack of energy, fatigue, poor work performance, increased risk of hemorrhage, sepsis, lactation failure, cardiac failure and maternal mortality<sup>4</sup> Neonatal

complications like preterm delivery, low birth weight, intrauterine growth restriction is also more common in mothers with anaemia.<sup>5</sup>

Understanding the impact of various levels of anemia on pregnant women and their new born is of paramount importance. Hence, this prospective observational study was undertaken, to estimate the prevalence of anemia in pregnancy, and associated maternal and perinatal complications, in a tertiary care urban setting.

### Primary Objective:

To study the impact of maternal anemia on maternal and neonatal outcome

### Secondary Objectives:

To determine the prevalence of anemia in pregnancy at JSS Hospital Mysuru.

To determine maternal and perinatal complications associated with maternal anemia

### Materials and methods:

**Study Design:** Observational Study

**b) Study Duration:** One year from August 2019-september 2020.

**c) Sampling technique:** Convenience sampling

**d) Study setting and Method of collection of data:**

1. It was a hospital based prospective study for duration of 1 year extending from September 2019 to August 2020.
2. All pregnant women delivering in JSS Hospital were allocated to the study.
3. Maternal demographical data such as: Age, parity, education, socioeconomic status, occupation, residence was recorded.
4. Relevant history was recorded, and clinical examination done. Investigations were noted, and women were classified as anemic or non-anemic.
5. Women with anemia (Hb < 11 gm %), were further classified based on the severity of anemia, as described by the WHO.

Normal  $\geq 11$  gm%

Mild 10 - 11 gm%

Moderate 7- 10 gm/dl

Severe < 7 gm%

In women with anemia, further investigations such as Peripheral blood smear, Serum ferritin levels and RBC indices were done to determine the type of anemia. Further investigations such as HPLC, bone marrow aspiration, etc were done only if clinically indicated. The outcome of all women was noted, and any complications such as antepartum and post-partum hemorrhage, sepsis, preterm labor, lactation failure were recorded. Perinatal outcome of all fetuses was documented, and each baby was followed up till discharge. Any perinatal complications such as low birth weight, pre term delivery, intrauterine growth restriction, sepsis, mortality, etc. were recorded.

**Inclusion Criteria:**

All pregnant women more than 28 weeks of gestation following up at JSS hospital, Mysore.

**Exclusion Criteria:**

- 1 Pregnancy terminated before 28 weeks of gestation
- 2 Incomplete data

**Results:**

The data was analyzed using MS Excel and R-4.0.5 software. All the tests of significance were carried out at 5% level of significance. The statistical methods used were: Descriptive Statistics, frequency tables, Summary Statistics and Inferential Statistics – Chi-square test.

The patients belonged to the age group varying from 18 to 45 years, of which 51.6% were 25-35 years of age. Those belonging to the lower middle class accounted for 49.7% and 44.9% came from the upper lower class as based on modified Kuppuswamy's classification. There was an equal distribution (49.9 and 50.1%) of urban and rural population respectively. There was no statistically significant difference in the severity of anemia among the urban and rural population ( $p=0.6$ ). On comparing the educational status of the women, we found no significant association between the severity of anemia and their educational status.

On assessing the nutritional status of the women, their Body mass index ranged from 17 to 37.3 kg/m<sup>2</sup>, with a mean of 23.8 and standard deviation of 3.08. A mean calorie deficit of 346 kcal/day was observed in the women with a standard deviation of 235.8 kcal/day, and a mean protein deficit of 4.6 gm/day was seen with a standard deviation of 5.12 gm/day.

The majority of women (47.2%) were primigravida's, 35% had conceived for the second time, and the rest had higher order pregnancies. There was no statistically significant difference in the severity of anemia and the obstetric score. Seventy nine percent women had term deliveries, 16% had preterm deliveries and 5% were post-dated.

A total of 597 women were studied, of which 349 had varying degrees of anemia. Hence the prevalence of anemia in pregnancy in our study was 58.5%. Mild anemia was seen in 36.3%, moderate in 6.2% and severe anemia in 15.9% of the women. Iron deficiency (serum iron <60 mcg/dl) was seen in

41.2% of women. Ferritin levels <50 ng/ml were seen in 22.1% suggesting deficiency in iron stores.

Microcytic hypochromic blood picture was seen in 28.5% of women. Dimorphic anemia was seen in 1.2% and macrocytic anemia in 0.3% suggesting that isolated vitamin B12 or folic acid deficiency was not common. Routine deworming was given to only 4.4% of the women in our study, suggesting a gross deficiency in awareness.

Blood transfusion in the antenatal period was given to 1% of the subjects, whereas 9.4% of women received parenteral iron therapy. On studying the mode of delivery, 54.6% delivered by emergency lower segment caesarean section. Twenty eight percent had a full term normal delivery. Instrumental delivery was needed in 1.6% of women. The rate of

pre term births was 15.3%. There was a significant association (p=0.02) between the cause of anemia and mode of delivery, as majority of women with nutritional or anemia of chronic disease delivered by emergency caesarean section.

Women with nutritional anemia especially moderate to severe anemia; had significantly more lactational failure than those with other causes. There was also a significant association between the severity of anemia, especially nutritional anemia being more prone for ante partum and post-partum hemorrhage. We also found that women with moderate to severe nutritional anemia were significantly more likely to develop preeclampsia/eclampsia and post-partum sepsis/infection.

The maternal and fetal complications are tabulated in table 1 and 2.

**Table 1: Maternal Complications.**

Maternal Complication	Number	Percentage
APH	12	2%
PPH	133	22.25%
Preeclampsia/Eclampsia	55	9.2%
Sepsis	55	9.2%
UTI	2	0.33%
Wound infection	10	1.68%
Preterm labor	28	4.69%
Lactational failure	123	20.57%
ICU admission	81	13.55%
Rupture Uterus	1	0.16%
AKI	2	0.33%
Pulmonary edema	2	0.33%
Acute limb ischemia	1	0.16%
Thrombophlebitis	3	0.48%
Oligohydramnios	10	1.67%
Polyhydramnios	8	1.33%
Breast abscess	1	0.16%
Lower respiratory tract	4	0.64%

infection		
PRES with Acute CVT	1	0.16%
Postpartum psychosis	1	0.16%
Adherent placenta	1	0.16%
Placenta previa	1	0.16%
Fibroid	3	0.48%
Ovarian cyst	1	0.16%
Bladder injury	1	0.16%

**Table 2: Fetal/ Neonatal complications**

Complication	Number	Percentage
Still Birth (IUFD)	5	0.84%
Early Neonatal death	3	0.50%
Low birth weight	88	14.71
IUGR	21	3.51%
Sepsis	55	9.2%
Jaundice	114	19.06%
Respiratory distress	39	6.52%
Hypoglycemia	30	5.01%
Meconium aspiration	3	0.48%
Dehydration	27	4.51%
Congenital heart disease	11	1.84%
Fever	10	1.67%
Birth asphyxia	1	0.16%
Macrosomia	7	1.17
AKI	2	0.33%
Congenital pneumonia	1	0.16%
Rh incompatibility	1	0.16%
Congenital hypothyroidism	1	0.16%
UTI	2	0.33%
Tractional injury to neck	1	0.16%
Neonatal depression	3	0.48%
Caput succedaneum	4	0.66%

Phenylketonuria	1	0.16%
Single umbilical artery	1	0.16%
Undescended testis	2	0.33%
Cystic hygroma	1	0.16%
Electrolyte imbalance	5	0.84%

The mean birth weight of the babies was 2.8 kg, with a standard deviation of 0.58. Seventy percent of the neonates were appropriate for gestational age. Low birth weight was seen in 15.2%; 2.5% and 1% belonged to the very low birth weight and extremely low birth weight categories. The hematocrit of the newborns ranged from 20.4 to 79.3% with a mean of 50.15% and a standard deviation of 4.94. There was no significant association between the severity of anemia and birth weight. However nutritional anemia was significantly more likely to be associated with low birth weight (p=0.02). There was also a significant association between neonatal jaundice and sepsis with moderate to severe nutritional anemia in the mother.

**Discussion:**

Anaemia is a global public health problem affecting both developing and developed countries. Approximately 1.62 billion people suffer from anaemia, and pregnant women are the most susceptible group. Surveys conducted by the Indian council of Medical research show that the prevalence of anemia in pregnancy is approximately 70% in India.<sup>2</sup> Other studies by various authors quote prevalence as high as 82 -96%<sup>(6,7,8)</sup> In our study we found the prevalence of anemia in pregnancy to be 58.5%, which is less than that quoted by the ICMR. Anaemia in pregnancy has significant effects on the health of both, the mother and the foetus.

Our study aimed to determine the prevalence of anaemia in pregnancy, its causes, and the impact on maternal and fetal well-being. Nutritional deficiency was found to be the major cause of anemia in our study. The high prevalence of anaemia can be attributed to low dietary intake of iron and folic acid, deprived bioavailability of iron or chronic blood loss due to infections.<sup>9</sup> Severe anaemia among the participants in a study done by Suryanarayana et al was 2.3% which was similar to study by Kapil and

Sareen (1.6%)<sup>10</sup> In our study, we found the prevalence of severe anaemia to be 15%, which correlated with the findings of Totegea (13.1%), Agarwal et al. (9.2%), Vivek et al. (7%), and Gautam et al. (22.8%).<sup>6-8,11</sup> In a study by Bhargavi Vemulapalli et Al., 40.97% had a moderate degree of anaemia and 6.28% of the population had a severe degree of anaemia.<sup>12</sup>

Angelitta et al suggested that maternal age, parity and late prenatal visits were also associated with maternal anemia, low birth weight and pre term birth.<sup>13</sup> A meta-analysis by Shopbop Rahmathi et al shows significant relationship with low birth weight, preterm delivery and small for gestational age babies more in women who had anemia in the first trimester.<sup>14</sup> Another prospective study by Ravishankar Suryanarayana et al shows high prevalence of anemia in pregnant women increases the maternal and fetal risk.<sup>15</sup> We found a significant association of the severity of anemia with various maternal complications like ante partum and post-partum hemorrhage, purpureal sepsis, lactation failure and preeclampsia.

Similarly, fetal complications like low birth weight, newborn sepsis and jaundice were also significantly higher in women with moderate to severe anemia. Evidence shows that nutritional anaemia prior to or in early pregnancy can lead to low birth weight and preterm delivery.<sup>14</sup> Suryanarayana et al reported in their study that 25% of women delivered low birth babies; of which 57% women had varying degrees of anaemia.<sup>15</sup> A study by Sangeetha in Bangalore reported highest (63%) prevalence of low birth weight among pregnant women, whereas Marahatta observed 16.6% low birth weight babies.<sup>1,16</sup>

We found no statistically significant association of the severity of anaemia with obstetric score, education, income or rural and urban residence. However, various studies report that women who had

secondary or higher education were less likely to be anaemic compared to their counterparts as educated women tend to have better income and have a balanced and nutritious diet.<sup>17</sup> Lower income is associated with limited resources and hence poor nutritional status. Researchers in Ethiopia showed that women with low income were more likely to have anaemia in pregnancy than women with higher income.<sup>18,19</sup>

There were no maternal mortalities reported in our study. However, anaemia is one of the leading causes of maternal mortality in developing countries. In the Indian population, 19% of the maternal deaths were related to anaemia as cited in a review by Anand.<sup>20</sup> Anaemia also acts as a contributory factor to maternal deaths caused by haemorrhage, septicaemia, and eclampsia.

### Conclusion:

Anaemia continues to be a major public health problem in the Indian setup and it increases the maternal

and fetal risks. In spite of various health care programmes aimed at improving nutritional status of antenatal women, and increasing institutional deliveries, implementation at the grass root level is still a challenging task. Priority should be given to prevention, early diagnosis and management of anaemia in pregnancy at primary health care level. Education regarding prevention of anaemia, nutritious diet and adequate supplements during pregnancy and lactation should be emphasised.

Health workers should be educated to diagnose high-risk pregnancy, and make appropriate referrals to higher centres in order to prevent complications. Finally, the health system should focus on various factors that contribute to the occurrence of anaemia and include them as important indicators in the National Health Policy.

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