

# Incidence of Maternal Anemia and its Effects on Placenta and Neonates

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## ABSTRACT

**Background:** Anaemia during pregnancy is a most common health problem especially in developing countries, where more than 70% of pregnant women have been suffering with anaemia. Diagnosis of maternal anaemia is a feasible procedure; it can be evaluated by haemoglobin estimation and peripheral smear. Serum ferritin investigation is useful in diagnosing iron deficiency in pregnant women. **Aim:** The present study aim is to assess neonatal outcome and placental changes among maternal anaemia patients attending at a tertiary care hospital. **Methods:** A prospective comparative study conducted on 100 pregnant women from March 2019 to November 2019. 50 women were considered as cases that had anaemia during pregnancy and 50 pregnant women without any obstetric complications were considered as controls. All the findings and histological features were recorded in pre designed proforma and results were analyzed. **Results:** Out of 50 neonates born to anaemic patients, 1 (2%) case had preterm birth, 2 (4%) still births and 6 (12%) low birth weight newborns. On assessment of Statistical significance, gestational age, birth weight, haemoglobin of both group neonates showed significant ( $p < 0.05$ ). Apgar score between anaemic pregnant and normal pregnant population doesn't showed any significance. Increased villous vascularity, syncytial knots, intervillous fibrinoid, intervillous stromal fibrosis has shown in 60%, 62%, 66% and 56% of maternal anaemia cases. **Conclusion:** In developing countries, iron supplementations are definitely recommended. Women education and empowerment is needed to combat anaemia and other maternal health problems.

**Keywords:** Maternal outcome, Neonatal Outcome.

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## INTRODUCTION

Anaemia is defined as values that are more than two standard deviations below the mean, then by using these ranges, a haemoglobin  $< 15.8$  g/dl or a HCT  $< 41.0$  percent represents anaemia in men and a value  $< 12.0$  g/dl or  $< 36.0$  percent, respectively, represents anaemia in women. Normal ranges other than the above have been proposed different lower limits of normal, ranging from 13.0 to 14.2 g/dl for men and 11.6 to 12.3 g/dl for women.<sup>[1]</sup>

Anaemia during pregnancy is a most common health problem especially in developing countries, where more than 70% of pregnant women have been suffering with anaemia. Maternal anaemia is associated with increasing maternal and neonatal complications.<sup>[2]</sup> Incidence of maternal anaemia in developing countries noted prevalence in the range of 44 to 81%.<sup>[3-6]</sup>

Anaemia causes major changes in the maternal circulatory system leading to maternal and foetal hypoxia and had very serious effects both on mother and foetus. The main reason for anaemia during pregnancy is increase in demand for iron, which is not easily fulfilled by regular dietary intake. Due to this, there is insufficient availability of Iron for

incorporation into erythroid precursors.<sup>[7]</sup>

Maternal anaemia is associated with increased incidence of toxemia, hydramnios, APH, preterm labour, PPH in the mother and prematurity, low birth weight and anaemia in the newborn.<sup>[8]</sup> Placental sizes increases in iron deficiency anaemia patients, which helps the foetus to extract more oxygen to compensate for maternal anaemia and the placenta is usually underperfused. Diagnosis of maternal anaemia is a feasible procedure; it can be evaluated by haemoglobin estimation and peripheral smear. Serum ferritin investigation is useful in diagnosing iron deficiency in pregnant women.

The present study aim is to assess neonatal outcome and placental changes among maternal anaemia patients attending at a tertiary care hospital.

## MATERIALS & METHODS

A prospective comparative study conducted on 100 pregnant women from March 2019 to November 2019 in the department of OBG at Government Maternity Hospital, Osmania Medical College, Hyderabad, Andhra Pradesh.

### Inclusion criteria:

Pregnant women at term gestation, with singleton pregnancy irrespective of parity.  
Patients of age group 18-35 years

### Exclusion criteria:

Patients not willing to participate in this study  
Patients with associated obstetrical complications

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**Anaemia due to other causes**

Among 100 pregnant women selected for this study, 50 women were considered as cases that had anaemia during pregnancy and 50 pregnant women without any obstetric complications were considered as controls. Control group women were selected in such a way that age group and term gestation with singleton pregnancy parameters were matched with cases.

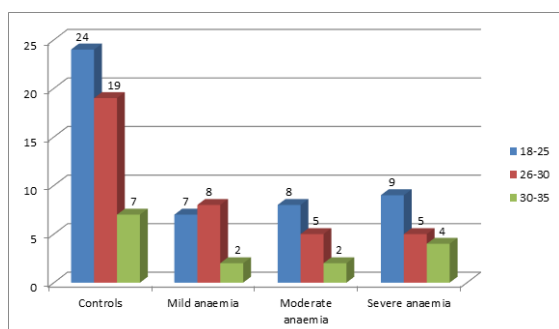
Participant's history pertaining to age, socioeconomic status, address, booked/unbooked, gravida, parity, gestational age calculated from LMP or early first trimester scan was recorded. Relevant past history, personal and obstetric history findings were noted.

After taking history, general examination, systemic examination and per vaginal assessment was done. Patients were advised to undergo complete hematological examinations including CBP, viral markers testing, RBS, blood grouping, coagulation profile, RFT, LFT, complete urine examination and required radiological investigations such as USG, CT. Fetal well-being was assessed by modified biophysical profile (NST, AFI) and Doppler velocimetry when it is needed.

Patient complete blood picture, serum ferritin were assessed by sending 3 ml of serum and 2 ml of EDTA samples to laboratory. During delivery, placenta is collected and kept in 10% formalin saline, which has been sent immediately to department of pathology.

Post-delivery health monitoring of mother and fetus was taken care and treated accordingly. All the findings and histological features were recorded in pre designed proforma and later entered in Microsoft excel sheet. Results were analyzed and findings were expressed as numbers, percentages.

**RESULTS**

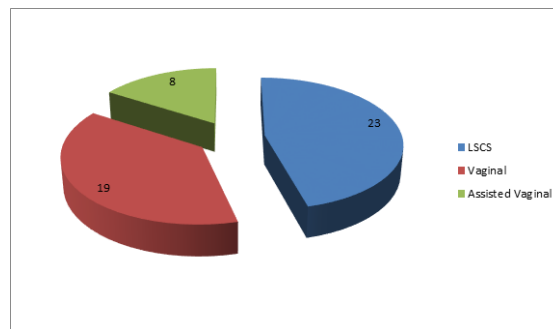


**Figure 1: Age wise distribution of study population**

In the present study, we categorized 50 anaemic pregnant patients as mild, moderate and severe according to WHO classification system. Out of 50 anaemic pregnant women, 11 (22%) were primigravidae and 39 (78%) were multigravidae. Out of 50 cases, anaemia was mild in 17 (34%) patients, moderate in 15 (30%) patients and severe in 18 (36%) patients.

Among anaemic pregnant women, 48% were in the age group of 18-25 years, 36% were in the age group of 26-30 years and 16% were in 30-35 years of age [Figure 1].

Among 50 anaemic cases, 23 (46%) patients underwent LSCS, 19 (38%) patients had normal vaginal delivery and 8 (16%) were assisted vaginal delivery.



**Figure 2: Showing Mode of delivery distribution**

Out of 50 neonates born to anaemic patients, 1 (2%) case had preterm birth, 2 (4%) still births and 6 (12%) low birth weight newborns.

The mean and standard deviation of various parameters such as gestational age, birth weight, apgar score and haemoglobin of neonates were tabulated in [Table 1]. On assessment of Statistical significance, gestational age, birth weight, haemoglobin of both group neonates showed significant (p<0.05). Apgar score between anaemic pregnant and normal pregnant population doesn't showed any significance.

**Table 1: Showing mean and SD of various parameters of cases and control groups**

Parameters	Cases	Controls	OR at 95% CI	P value	Significance
Gestational Age	38.1±0.78	39.4±0.63	1.31(1.01-1.58)	<0.001	SS
Body weight	3012.00±397.23	3905.20±306.52	89320(7528-103401)	<0.001	SS
Apgar Score 1 minute	8.52±0.56	8.70±0.52	0.18(-0.03-0.39)	0.099	NS
Apgar Score 5 minutes	8.74±0.42	8.86±0.34	0.12(-0.06-0.30)	0.198	NS
Hemoglobin	15.1±1.35	16.3±1.28	1.20(0.67-1.72)	<0.001	SS

Placental histological features were tabulated in [Table 2]. 28% of controls showed increase in villous vascularity, syncytial knots, intervillous stromal fibrosis and 12% of them had increase in intravillous fibrinoid in placenta. Increased villous vascularity, syncytial knots, intravillous fibrinoid, intervillous stromal fibrosis has shown in 60%, 62%, 66% and 56% of cases. Placental changes between

both the groups showed statistical significance ( $p < 0.05$ ).

**Table 2: Showing Placental changes in both groups and their significance**

	Control	Mild	Moderate	Severe	Chi Square test	P value	Significance
<b>Villous vascularity</b>							
Normal	36	8	6	6	11.05	0.01	SS
Increased	14	9	9	12			
<b>Syncytial Knots</b>							
Normal	36	8	5	6	12.5	0.005	SS
Increased	14	9	10	12			
<b>Intravillous Fibrinoid</b>							
Normal	44	8	5	4	32.9	0.00001	SS
Increased	6	9	10	14			
<b>Intervillous Stromal Fibrosis</b>							
Normal	36	10	6	6	10.5		NS
Increased	14	7	9	12			

## DISCUSSION

In developing countries one of the most encountered problems is maternal anaemia, which contributed significantly to maternal and perinatal morbidity and mortality. During pregnancy, to support foetal growth and development requires an increase in placental blood flow which occurs by increase in maternal cardiac output by 50%. For this, the maternal plasma volume needs to be increased, on expansion of plasma volume, maternal blood dilution occurs which leads to gestational anaemia.

A Variety of placental changes can be seen in maternal anaemia cases. Morphological changes include decrease in number of cotyledons and the insertion of cord was more towards margin. Gross features include increased calcifications and areas of infarction. Histopathological features include thickening of basement membrane of trophoblast, increase in capillaries per villi, formation of vasculo-syncytial membrane, increased syncytial knots, cytotrophoblastic proliferation, stromal fibrosis, inter-villous hemorrhage, endarteritis obliterans and fibrinoid necrosis.

AS per this study, Out of 50 cases, anaemia was mild in 17 (34%) patients, moderate in 15 (30%) patients and severe in 18 (36%) patients. Most commonly affected age group was 18-25 years which is similar to Emre Karafлахin et al,<sup>[9]</sup> Patel Manthan et al.<sup>[10]</sup>

Patel Manthan et al,<sup>[10]</sup> reported out of 100 anaemic pregnant women, 20% mild, 44% moderate and 36% had severe anaemia. Animesh Gupta et al,<sup>[11]</sup> documented 50.6% pregnant women had moderate anaemic and the prevalence of anaemic pregnant women was 60.38%. Gitanjali Kapoor et al,<sup>[12]</sup> documented 30% mild, 50% moderate and 12% severe anaemic pregnant women. Vindhya J et al,<sup>[13]</sup> observed the prevalence of maternal anaemia as 33.9%, among them 48.4% were mild, 49.5% moderate and 2.1% were severely anaemic. The haemoglobin level of all the participants was  $11.33 \pm 1.460$  g/dl. Madhu Priya et al,<sup>[14]</sup> stated moderate anaemia was slightly higher (31.2%) than mild anaemia (30%) with a mean haemoglobin level of 11.7 g/dl.

Among 50 anaemic cases, 23 (46%) patients underwent LSCS, 19 (38%) patients had normal vaginal delivery and 8 (16%) were assisted vaginal delivery in the present study. Emre Karafлахin et al observed 162 pregnant women, categorized into two groups: G1 women in 2nd trimester with Hb levels  $< 8$  g/dl and G2 women in 2nd trimester with Hb levels  $10$  g/dl. They noted Mean Hb concentrations of G1 and G2 were  $7.63 (-/+ 0.34)$  gr/dl, and  $11.82 (-/+ 1.23)$  gr/dL. G1 had a normal delivery rate of 69.8% (n:113), and cesarean rate was 30.2% (n:49). Normal delivery rate of G2 was 72.5% (n:116), and cesarean rate was 27.5% (n:44).

Out of 50 neonates born to anaemic patients, 1 (2%) case had preterm birth, 2 (4%) still births and 6 (12%) low birth weight newborns in the present study. In similar to our study, Grace Stephen et al,<sup>[15]</sup> documented 2.3% still births, 3.6% low birth weight and 0.45% preterm birth cases. Animesh Gupta et al,<sup>[11]</sup> observed 5.54% of stillbirth/Intrauterine death (IUD), 8.3% mothers delivered low birth weight baby. They also found that higher number of LBW and IUD babies delivered by mothers who were having moderate anaemia. According to WHO,<sup>[16]</sup> 2015 estimates 13% LBW and 12.7% preterm births among maternal anaemia patients. In contrast, Patel Manthan et al,<sup>[10]</sup> reported higher percentage of low birth weight neonates (50%).

On assessment of Statistical significance, birth weight, haemoglobin of both group neonates showed significant ( $p < 0.05$ ). Apgar score between anaemic pregnant and normal pregnant population doesn't showed any significance as per the present study. Gitanjali Kapoor et al,<sup>[12]</sup> stated 57% LBW babies ( $p < 0.05$ ) and children with APGAR score  $< 7$  were more amongst anaemic women as compared to non-anaemic ( $> 0.05$ ). Pankaj Kumar et al,<sup>[17]</sup> documented that among moderate and severe anaemic patients, LBW was significantly increased with odds ratio of 4.6 ( $p = 0.001$ ) and 8.1 ( $p = 0.0001$ ) respectively. Apgar score showed significant increase in severe anaemic cases ( $p = 0.001$ ). Few studies also noted low apgar scores in anaemic patients.<sup>[18,19]</sup> Ali et al,<sup>[20]</sup> also observed the risk of low birth weight which was 2.5 times higher in

women with mild/moderate anaemia and 8 times higher in women with severe anaemia. However, Kidanto et al,<sup>[21]</sup> reported increased risk of low birth weight with odd's ratio of 1.2, 1.7 and 3.8 with mild, moderate and severe anaemia respectively. Lone FW et al,<sup>[22]</sup> stated 4 times higher preterm birth risk, 1.9 times LBW risk, 1.8 times low appgar score risk in anaemic patients when compared to non anaemic. Bondevik GT et al,<sup>[23]</sup> compared haematological status of mother and neonatal outcome, observed mothers with hematocrit value under 24% had high number of LBW and preterm births significantly. Increased villous vascularity, syncytial knots, intravillous fibrinoid, intervillous stromal fibrosis has shown in 60%, 62%, 66% and 56% of cases. Placental changes between both the groups showed statistical significance ( $p < 0.05$ ) in the present study. Lelic M et al,<sup>[24]</sup> observed significant increase in terminal villi blood vessels in anaemic mothers, but total placental mass and volume did not differ significantly. Anupam Baske,<sup>[25]</sup> noted 27% fibrinoid necrosis, 33% hyalinised villous spots, 40% villous fibrosis, 60% increased intervillous space, 50% intervillous thrombosis, 30% abnormality in cytotrophoblast, 83% syncytial knots, 40% excessive calcified patches. Haung A et al,<sup>[26]</sup> stated the total area of the intervillous space or the chorionic villi per placenta is significantly increased in the anemic mother. Levario-Carrillo M et al,<sup>[27]</sup> documented that in Iron deficiency anaemic patients, increase in perivillous fibrin depositions were due to localized stasis and maternal blood thrombosis in the intervillous space.

In malaria endemic areas, anaemia in pregnancy cause high morbidity and mortality.<sup>[28]</sup> The Indian subcontinent alone contains nearly half the world's anaemic women.<sup>[29]</sup> Even among women with iron deficiency who are not necessarily anaemic, reported higher risk of urinary tract infection, pyelonephritis and preeclampsia.<sup>[30]</sup> Iron stores in pregnancy population can be supplied with any drug formulations, but preferred is Oral iron preparation. Adequate iron stores can help pregnant women replace lost red blood cells.

State and Central government health agencies have been educating pregnant women, providing food, medications and resources to all pregnant women through various schemes and organizations. For good maternal and child outcome compulsory education required was attending regular antenatal care visits, taking balanced diet and medications, utilization of skilled attendance during delivery, exclusive breastfeeding, maintaining hygiene measures and seeking immediate health care when the children got infectious fevers.

## CONCLUSION

In the present study, Out of 50 neonates born to anaemic patients, 1 (2%) case had preterm birth, 2

(4%) still births and 6 (12%) low birth weight newborns. Low birth weight and placental changes were significantly increased in anaemic women when compared to normal pregnant women. In developing countries, iron supplementations are definitely recommended. Women education and empowerment is needed to combat anaemia and other maternal health problems.

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