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Maternal and Fetal Outcome in Anemia during Pregnancy

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Abstract: ***Background**: Anemia has been a very important nutritional disorder in the world. India has reported high prevalence of anemia in pregnancy. Most of the articles have reported an adverse pregnancy outcome related to anemia.Apart from that, there was no consistency in the timing of haemoglobin considered for analysis. Hence, we designed an observational study to look into these aspects. **Methods**: Women coming to SVMCH & RC with haemoglobin less than 11gm/dl in labour and for safe confinement. They will be followed up till 6th week of postpartum. Maternal and fetal outcomes were noted. Descriptive statistics was used for baseline characteristics. Comparison of means was done using Student's t-test. Qualitative variables were compared using Fisher's exact test. **Results**: It was observed that out of 208 anemic patients taken into study, 49.5% had mild anemia, 26.4% had moderate anemia, 6.7% had severe anemia, 17.3% had very severe anemia. The minimum Hb% was 3gm%, and maximum was 10.9 gm%. Majority of women had mild anemia i.e., 49.5%. Out of 208 cases 30 (14.4%) cases were reported to have low APGAR at 5 minutes and 178 (85.6%) cases were not reported with low APGAR at 5 minutes. Out of 208 cases 93 (44.7 %) cases were reported to have lower birth weight and 115 (55 .7%) cases were not reported with lower birth weight. Out of 208 cases 34 (44.7 %) cases were reported with FGR and 174 (55 .7%) cases were not reported with FGR. Among 208 cases 2(1%) cases were reported to have neonatal deaths and 206(99%) cases were not reported with neonatal deaths.*

1. Introduction

Several South East Asian countries, including India, suffer from anemia in pregnancy. It is estimated that between 16% and 40% of maternal deaths are caused by anemia. Maternal morbidity is also significantly increased by anemia. During pregnancy, various nutrients are required, particularly iron and folate, lack of which puts a strain on the body, precipitating or aggravating anemia. A major cause of anemia during pregnancy is hemodilution. Outpatient department patients with iron deficiency anemia are most likely to be pregnant. Rural areas in India lack access to good health care services for most of the population [1.]

Social factors like early marriage, teenage pregnancy, and insufficient iron supplementation, malnutrition, and malaria and worm infestations are also responsible for anemia during pregnancy[2]

According to WHO guidelines, hemoglobin levels less than 11 grams per deciliter are considered anemia. India has a 65% to 75% incidence of anemia during pregnancy, according to standards set[3]

The National Nutritional Anemia Control Programme (NNACP) in India provides free iron and folic acid supplements to pregnant women starting in the second trimester and continuing until three months postpartum. According to a recent study conducted by the Healthcare Research Association for Adolescents and Nutrition Foundation of India, New Delhi, 84% rural pregnant women suffer from severe anemia. Data from the Indian Council for Medical Research (ICMR) also shows that there is prevalence of anemia of 84.2% among rural pregnant women, of these13.1% are severely anemic[4]

A study found that South Asia has the lowest coverage of antenatal care in the world. It has been reported that only 54% of pregnant women go for at least one antenatal care appointment. In India, only 34% of pregnant women give birth in a hospital, 44% have received antenatal care, and 67% have been vaccinated against tetanus toxoids during pregnancy. The nearest Antenatal Clinic is only accessible to a small number of these women[5]

Anaemia is prevented in India by the National Nutritional Anaemia Prophylaxis Programme, which was launched in 1972. Anaemia prevalence has remained alarmingly high for the past three decades despite the program's reinforcement. The magnitude of anemia and its adverse obstetric effects have not changed in 50 years of independence. In the Reproductive and Child Health Programme (RCH), the goal is to improve reproductive health. The project, which was launched formally on October 15, 1997, aims to reach out to the most vulnerable members of society, including pregnant women, and integrate all interventions related to fertility regulation, maternal and child health with reproductive health. Among the interventions of the programme is the control of anaemia among pregnant women [6]

For diseases of which cause or cure are unknown or if treatments are expensive, mortality and morbidity are high. Despite the fact that cause of anemia is known in the majority of cases and iron treatment is one of the cheapest treatments, most cases are neglected or not diagnosed on time. Blood transfusions, oral iron, and parenteral iron are all available treatment options. The risk of parenteral iron therapy and blood transfusion can be avoided if anemia is detected early and three hemoglobin measurements are performed during the entire pregnancy.[8]

Ultimately, maternal mortality will be reduced through the elimination of anemia in the female population. This will result in better maternal and perinatal health, a happy family, as well as a healthy nation. For pregnant women with anaemia, a multifaceted approach is needed. Managing anaemia with pregnancy on a war footing is extremely important[9]

2. Materials and Methods

Study Design
Prospective study

Study Population
All unbooked pregnant women coming to svmch & rc with haemoglobin less than 11gm/dl in labour and for safe confinement. They will be followed up till 6th week of postpartum.

Sampling Technique
Convenient sampling, a hospital-based study

Duration Of Study – March 2021 – August 2022 (18 months)

Participation Timeline– During labour and 6 weeks of postpartum period

Inclusion Criteria
All unbooked pregnant women coming to svmch and rc with hemoglobin less than 11gm/dl at term during labour or for safe confinement

Exclusion Criteria
- Booked antenatal patients
- Preterm labour
- Anemia in pregnancy due to Antepartum haemorrhage
- Patients with history of medical disorders in pregnancy except anemia.
- Multiple pregnancy
- Pregnancy with fetal complications like IUGR (due to other causes except anemia) and Fetal anomalies/ malformations are ruled out by USG.
- Known cases of Hereditary hemolytic anemias (RBC membrane defects and spherocytosis), Thalassemia, sickle cell anemia.

Fetal outcome
- APGAR
- Birth weight
- Fetal growth retardation
- Still birth
- NICU admission

Maternal outcome

During pregnancy
Infections
Cardiac failure (at 30-32 weeks)

During labour
Postpartum haemorrhage
Cardiac failure
Shock

During puerperium
Subinvolution
Puerperal sepsis
Lactation failure
Pulmonary embolism

Data Collection Methods: This study will involve screening of 208 consenting unbooked eligible women coming during labour or for safe confinement at term. Blood will be collected from the patients by venepuncture (2ml) into a vacutainer containing EDTA and hemoglobin is estimated by automated method. Hemoglobin estimation and peripheral smear study will be done. Patients will be divided into subgroups according to the severity of anemia. All the patients will be followed till the sixth postpartum week. Pregnancy outcome will be studied statistically.

3. Results

It was observed that out of 208 anemic patients taken into study, 49.5% had mild anemia, 26.4%had moderate anemia, 6.7% had severe anemia, 17.3% had very severe anemia. The minimum Hb% was 3gm%, and maximum was 10.9gm%. Majority of women had mild anemia i.e,49.5%.In mild anemic group 28 cases were between the age group of 20 and below, 23 cases were reported between the age group of 21-24, 33 cases were reported between the age group of 25- 29 and 19 cases were reported between the age group of 30 and above. Among the groups highest number of cases that is 63(30.3%) were reported in the age group of 20 and below and the lowest number of cases were reported in the age group of 30 and above. In this study, majority of women 190(91.33%) had normal, regular menstrual cycles and a smaller number of cases 18(8.7%) had menorrhagia.

Out of 208 study cases involved in the study majority of the cases 181 (87%) were reported with microcytic anemia. Smaller number of cases that is 27(13%) were reported to have dimorphic anemia.Out of 208(100%) cases involved in the study 93(44.7%) cases were reported to have normal birth weight and 115(55.3%) cases were reported to have lower birth weight. Among the study cases highest number of cases 55.3% had lower birth weight and smaller number of cases 44.7% were reported to have normal birth weight. Fetal outcome of 208 anemic cases were recorded. Out of 208 cases 47(22.6%) cases were reported to deliver in preterm and 161(77.4%) cases were not reported to deliver in preterm. Out of 208 cases 33(15.9%) cases were reported to have low APGAR at 1minute and 175(84.1%) cases were not reported with low APGAR at 1 minute. Out of 208 cases 30 (14.4%) cases were reported to have low APGAR at 5 minutes and 178 (85.6%) cases were not reported with low APGAR at 5 minutes. Out of 208 cases 93 (44.7 %) cases were reported to have lower birth weight and 115 (55 .7%) cases were not reported with lower birth weight.

Out of 208 cases 34 (44.7 %) cases were reported with FGR and 174 (55 .7%) cases were not reported with FGR. Among 208 cases 2(1%) cases were reported to have neonatal deaths and 206(99%) cases were not reported with neonatal deaths. Out of 208(100%) study cases 49(23.6%) were reported to have infection and 159(76.4%) cases were not reported with infections. Among the study cases 21(10.1%) cases were reported with PPH and 187(89.9%) cases were not reported with PPH. Among the 208(100%) cases 28(13.5%) were diagnosed with puerperal sepsis and 180(86.5%) cases were not diagnosed with puerperal sepsis. Out of 208(100%) cases none of the cases were reported to have CCF.

For postpartum morbidity, 5(2.4%) cases were reported and 203(97.6%) were not reported to have postpartum morbidity. Out of 208 anemic patients 40(19.2%) were reported for wound gaping and 168(80.8) cases were not reported to have wound gaping. Out of 208(100%) cases 31(14.9%) cases were failed to lactate and 177(85.1) cases were lactated.

Table 1: Distribution of cases of varying degrees of anemia according to maternal complications

Characteristics	Anemia								**n**	**%**
	Mild		Moderate		Severe		Very severe			
Maternal Complications										
Infections										
Yes	0	0.0	0	0.0	14	100.0	35	97.2	49	23.6
No	103	100.0	55	100.0	14	100.0	1	2.8	159	76.4
Chi-Square = 202.601 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
PPH	**ANEMIA**								n	%
	Mild		Moderate		Severe		V. Severe			
Yes	0	0.0	0	0.0	8	57.1	13	36.1	21	10.1
No	103	100.0	55	100.0	6	42.9	23	63.9	187	89.9
Chi-Square = 78.724 degrees of freedom = 3, P Value < 0.05,Conclusion: Association is highly significant.										
Puerperal Sepsis	**ANEMIA**								n	%
	Mild		Moderate		Severe		V. Severe			
Yes	0	0.0	0	0.0	9	64.3	19	52.8	28	13.5
No	103	100.0	55	100.0	5	35.7	17	47.2	180	86.5
Chi-Square = 52.89 degrees of freedom = 3, P Value < 0.05,Conclusion: Association is highly significant										
CCF	**ANEMIA**								n	%
	Mild		Moderate		Severe		V. Severe			
Yes	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
No	103	100.0	55	100.0	14	100.0	31	100.0	208	100.0
Chi-Square = 24.477 degrees of freedom = 3, P Value < 0.05,Conclusion: Association is highly significant										
Post Partum Morbidity	**ANEMIA**									
	Mild		Moderate		Severe		V .Severe			
Yes	0	0.0	0	0.0	2	14.3	3	8.3	5	2.4
No	103	100.0	55	100.0	12	85.7	33	91.7	203	97.6
Chi-Square = 53.92 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
Wound Gaping	**ANEMIA**								n	%
	Mild		Moderate		Severe		V. Severe			
Yes	0	0.0	13	23.6	9	64.3	18	50.0	40	19.2
No	103	100.0	55	76.4	5	35.7	18	50.0	168	80.8
Chi-Square = 65.451 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is significant.										
Failing Lactation	**ANEMIA**								n	%
	Mild		Moderate		Severe		V. Severe			
Yes	4	3.9	17	30.9	0	0.0	10	27.8	31	14.9
NO	99	96.1	38	69.1	14	100.0	26	72.2	177	85.1
Chi-Square=28.129degrees of freedom=3, P Value <0.05, Conclusion: Association is significant.										

Table 2: Distribution of cases of varying degrees of anemia according to fetal outcome

Characteristics	Anemia								n	%
	Mild		Moderate		Severe		Very severe			
Fetal Outcome										
PRETERM	n	%	n	%	n	%	n	%	47	22.6
YES	25	24.3	18	32.7	0	0.0	4	11.1	161	77.4
NO	78	75.7	37	67.3	14	100.0	32	88.9	208	100.0
Chi-Square = 10.195 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
LOW APGARAT1 MIN	**ANEMIA**								n	%
	Mild		Moderate		Severe		V.Severe			
YES	4	3.9	12	21.8	7	50.0	10	27.8	33	15.9
NO	12	96.1	43	78.2	7	50.0	26	72.2	175	84.1
Chi-Square = 28.586 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
LOW APGARAT5 MIN	**ANEMIA**								n	%
	Mild		Moderate		Severe		V.Severe			
YES	4	3.9	11	20.0	7	50.0	8	22.2	30	14.4
NO	99	96.1	44	80.0	7	50.0	28	77.8	178	85.6
Chi-Square = 37.99 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
LBW	**ANEMIA**								n	%
	Mild		Moderate		Severe		V.Severe			
YES	62	60.2	9	16.4	2	14.3	20	55.6	93	44.7
NO	41	39.8	46	83.6	12	85.7	16	44.4	115	55.3
Chi-Square = 34.822 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										

FGR	ANEMIA								n	%
	Mild		Moderate		Severe		V.Severe			
YES	6	5.8	12	21.8	7	50.0	9	25.0	34	16.3
NO	97	94.2	43	78.2	7	50.0	27	75.0	174	83.7
Chi-Square = 23.109 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										
NEONATAL DEATHS	ANEMIA								N	%
	Mild		Moderate		Severe		V.Severe			
YES	0	0.0	0	0.0	0	0.0	2	5.6	2	1.0
NO	103	100.0	55	100.0	14	100.0	34	94.4	206	99.-
Chi-Square = 9.648 degrees of freedom = 3, P Value < 0.05, Conclusion: Association is highly significant.										

4. Discussion

Preterm births were more common in mothers who were anaemic in the second and third trimesters, according to earlier studies. There are no patients for post-term birth, 75 patients for term birth, and 25 patients for pre-term birth. According to Kalaivani K et al., anaemia in pregnancy has been persistently linked to low birth weight and preterm delivery. In the study by K Jagadish Kumar et al., anaemic mothers had a significantly higher incidence of preterm births than nonanemic mothers, with the exception of the third trimester. Overall, the difference was greater than 5%, peaking in the third trimester. Numerous studies have found a similar association. Such an association has only been discovered by Kumar et al. and Monika et al. when mothers have severe anaemia, or Hb 7.0 g/dl[5,6] pregnancy outcomes and foetal growth are negatively impacted by anaemia in pregnant women (Bencaiova G, Breymann C.). Anemia during pregnancy has been repeatedly linked to low birth weight and preterm delivery (Haider BA, Sebastian T and van den Broek NR,). Yi et al. found that anaemia before becoming pregnant was linked to a higher risk of preterm delivery but not haemoglobin concentration[7]

According to Kozuki et al., mild to moderate maternal anaemia does not appear to be associated with intrauterine growth retardation. Birth weight increased linearly with an improvement in prenatal mean haemoglobin concentration [8] . Anemia during early pregnancy, but not late pregnancy, was linked to a slightly higher risk of preterm delivery and low birth weight, according to a meta-analysis by Haggaz et al 8], While Ahankari et al. stressed the importance of routinely checking haemoglobin levels during pregnancy and treating women with low levels to reduce the negative effects on neonatal health, they found that anaemia in the first and third trimesters was linked to an increased risk of low birth weight.

Numerous studies evaluating the impact of iron deficiency anaemia on foetal growth and SGA have been published, but the findings are inconsistent. There are very few studies on the third trimester, while the majority of studies concentrate primarily on the first and second trimesters.

It is evident that low foetal birth weight and SGA are linked to first-trimester iron deficiency anaemia. The two most recent systematic reviews backed up these findings. According to reports, low birth weight and SGA are not linked to iron deficiency anaemia in the second trimester. Yang et al report's that iron intake was linked to lower SGA rateslends support to this situation. Therefore, in routine clinical practise, iron deficiency anaemia in the first trimester is not a cause for concern regarding negative perinatal outcomes[9,10,11]

The average length in anaemic subjects was 47.26 1.24, while it was 48.34 1.07 in normal subjects. Furthermore, the T value for the age difference between the two groups was -4.673, and the p-value of 0.0001 indicated that the group differences are highly significant. The same study was also reported by P N Singla et al., who found that 54 anaemic (haemoglobin 11.0 g/dl) mothers had an impact on foetal growth due to maternal iron deficiency anaemia. They discovered that infants of women with depleted iron had significantly lower mid-arm circumference and crown-heel lengths than infants of women without anaemia. In their study, serum ferritin and maternal haemoglobin showed linear relationships with all foetal growth indicators. Maternal anaemia had a greater effect on foetal birth weight and mid-arm circumference than it did on other anthropometric measurements of the newborn in terms of growth retardation[12]

According to the reports of Van Geijn HP, Kayler WM, and Kramer M, the effect of maternal anaemia on intrauterine growth is attributed to chronic deprivation of oxygen to the developing foetus.

Out of 208(100%) study cases 49(23.6%) were reported to have infection and 159(76.4%) cases were not reported with infections. Among the study cases 21(10.1%) cases were reported with PPH and 187(89.9%) cases were not reported with PPH. Among the 208(100%) cases 28(13.5%) were diagnosed with puerperal sepsis and 180(86.5%) cases were not diagnosed with puerperal sepsis. Out of 208(100%) cases none of the cases were reported to have CCF. For postpartum morbidity, 5(2.4%) cases were reported and 203(97.6%) were not reported to have postpartum morbidity. Out of 208 anemic patients 40(19.2%) were reported for wound gaping and 168(80.8) cases were not reported to have wound gaping. Out of 208(100%) cases 31(14.9%) cases were failed to lactate and 177(85.1) cases were lactated

This result was comparable with 66% observed by Rangnekar et aland 69.1% by Khalida H et al[14]It is evident that low foetal birth weight and SGA are linked to first-trimester iron deficiency anaemia[16–18.] The two most recent systematic reviews [18,19.] Backed up these findings. According to reports, low birth weight and SGA are not linked to iron deficiency anaemia in the second trimester [19,20.]Yang et al report.'s that iron intake was linked to lower SGA rates [21]

5. Conclusion

Among various causes of anemia, 90% are nutritional in origin. Iron deficiency is the commonest nutritional anaemia followed by folic acid deficiency. Present study shows maternal anaemia is a significant risk factor for maternal outcomes like type of delivery, Puerperal infections, PPH, and fetal outcomes like low APGAR, birthweight, FGR. Lower the hemoglobin, greater was the incidence of perinatal mortality. Joint social and medical efforts are required for overall improvement of living status of women. Their awareness is to be increased about dietary habits, small family norms, birth intervals and regular antenatal visits. Proper antenatal care is the basic requirement for prevention, early detection and treatment of anemia.

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