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Association of maternal anemia with perinatal outcomes

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Abstract
Introduction: Anemia is one of the most prevalent nutritional deficiency problems afflicting pregnant women. Anemia that complicates pregnancy threatens the life of both the mother and the fetus. Nowadays, maternal anemia is considered as a public health problem in the world, especially in developing countries. Pregnancy increases considerably the iron needs in a mother. Iron deficiency is the most common cause for anemia during pregnancy.
Aims and objectives: To assess the association of maternal anemia with perinatal outcomes. To assess the association of anemia with postpartum haemorrhage, puerperal sepsis, venous thrombosis, subinvolution of uterus, lactational failure, delayed wound healing, maternal morbidity and mortality. To determine the relationship between maternal anemia during pregnancy and intrauterine death, IUGR, infant low birth weight, APGAR scores, preterm birth, stillbirth, neonatal morbidity and mortality.
Methods: A prospective observational study was conducted on 100 women who attended antenatal OPD, out of which 50 women diagnosed with iron deficiency anemia and 50 women who are non anemic and delivered at kamineni institute of medical sciences, narketpally from january 2022 to june 2022. Women whose age > 19 years and < 36 years, women with multiple gestation, gestational hypertension, pre-eclampsia, oligohydramnios, gestational diabetes mellitus, hypothyroidism, previously known case of hemolytic anemia, hemoglobinopathies such as thalassemia, sickle cell anemia, chronic renal disease, chronic liver disease, aplastic anemia and women who did not give consent to participate in the study are excluded from the study.
Results: In this study of 50 anemic patients, 10 of them had mild anemia (20%), 17 of them had moderate anemia (34%), 19 of them had severe anemia (38%), 4 of them had very severe anemia (8%). Distribution according to maternal outcomes out of 50 patients, was 17 patients (34%) had IUGR, 16 patients (32%) had preterm delivery, 13 patients (26%) had delayed wound healing, 9 patients (18%) had lactational failure, 2 patients (4%) had intrauterine death. There are no cases of postpartum haemorrhage, puerperal sepsis and no maternal death. In this study of 50 patients, distribution according to neonatal outcomes was 20 patients (40%) had low birth weight, 19 patients (38%) had low APGAR scores, 7 patients (14%) had neonatal sepsis and no cases of neonatal anemia and neonatal death.
Conclusion: Anemia is significantly associated with adverse maternal and neonatal outcomes and as the severity of anemia is increased, its adverse effects are even worse. Routine iron and folic acid, micronutrient supplementation regularly and whenever indicated parenteral iron infusions or blood transfusions must be done during pregnancy which prevents such adverse outcomes and has beneficial effects on the pregnancy outcome. Therefore, it is necessary for identification of anemia antenatally, prompt treatment for correction of anemia and measures to reduce the incidence of anemia in pregnancy to prevent adverse maternal and neonatal outcomes.

Keywords: Anemia, IUGR, IUD, preterm birth, pregnancy outcome

Introduction

Anemia is one of the most prevalent nutritional deficiency problems afflicting pregnant women [1]. The World Health Organization defines anemia in pregnancy as hemoglobin levels of less than 11 g/dl [1]. Anemia that complicates pregnancy threatens the life of both the mother and the fetus [1]. Nowadays, maternal anemia is considered as a public health problem in the world, especially in developing countries [2]. Pregnancy increases considerably the iron needs in a mother [3]. Iron deficiency is the most common cause for anemia during pregnancy [3]. The relationship between maternal anemia and perinatal outcomes such as increased risk of intrauterine death, IUGR, preterm delivery, LBW and low APGAR scores, perinatal morbidity and mortality is significant. Since anemia is considered to be one of the most common medical disorders during pregnancy, this association is of main importance [3]. Hemoglobin level is the well accepted indicator for anemia assessment [4].

Reduced levels of hemoglobin favour changes in placental angiogenesis, limiting the availability of oxygen to the fetus and consequently causing potential restriction of intrauterine growth and results in low birth weight [5]. Children born weighing less than 2500 g are more prone to infant morbidity and mortality [5]. Anemia increases the risk of postpartum haemorrhage, puerperal sepsis, venous thrombosis, subinvolution of uterus, lactational failure and delayed wound healing [6]. Timely identification of women with severe anemia and associated maternal complications during intrapartum and postpartum period like postpartum hemorrhage, puerperal sepsis, failure of lactation and subinvolution can help in reducing maternal morbidity and mortality [6]. Thus anemia is an important cause for maternal morbidity and mortality [6]. Anemia is the most prominent hematological manifestation of pregnancy, delivery and heralded cause of gestational complications and adverse birth outcomes [7]. Anemia is associated with adverse perinatal outcomes including preterm birth [7].

Aims and objectives

To assess the association of maternal anemia with perinatal outcomes. To assess the association of anemia with postpartum haemorrhage, puerperal sepsis, venous thrombosis, subinvolution of uterus, lactational failure, delayed wound healing, maternal morbidity and mortality. To determine the relationship between maternal anemia during pregnancy and intrauterine death, IUGR, infant low birth weight, APGAR scores, preterm birth, stillbirth, neonatal morbidity and mortality.

Inclusion criteria

Women attending antenatal OPD who are diagnosed with iron deficiency anemia and non-anemic women who delivered at kamineni institute of medical sciences, Narketpally.

Exclusion criteria

- Women who did not give consent to participate in the study.
- Women whose age <19 years and > 36 years, patients with multiple gestation, gestational hypertension, pre-eclampsia, oligohydramnios, gestational diabetes mellitus, hypothyroidism are excluded from the study.
- Patients with previously known case of hemolytic anemia, hemoglobinopathies such as thalassemia, sickle cell anemia, chronic renal disease, chronic liver disease, aplastic anemia are excluded from the study.

Materials and Methods

- **Type of study:** Prospective observational study
- **Period of study:** January 2022 to june 2022
- **Sample size:** 100
- **Place of study:** Department of Obstetrics and Gynaecology at Kamineni Institute of Medical Sciences [KIMS], Narketpally.

Hemoglobin levels, hematocrit, peripheral blood smear, mean corpuscular volume, mean corpuscular hemoglobin concentration, serum ferritin levels, reticulocyte count, stool examination are performed for evaluation for type of anemia. Diagnosis of iron deficiency anemia by presence of hypochromic red cells, microcytosis, poikilocytosis, anisocytosis, and low serum ferritin levels is made.

Gestational age was calculated from first day of last menstrual period. IUGR (Intrauterine growth restriction) was defined as the fetal growth (measured by ultrasound) less than the 10th centile for that gestational age. Preterm delivery was defined as delivery after 24 and before 37 completed weeks of gestation. The weight of new-borns and their APGAR scores at 1 and 5 min were recorded and the perinatal outcomes are noted.

Statistical analysis

The results are analysed using mean, standard deviation, P Value and ANOVA test, T-Test, SPSS version-19 software (Statistical package for social sciences) and Wilcoxon signed ranks test. The P Values will be calculated and P Value < 0.05 will be considered as significant.

Observations and Results

Table 1: Distribution of patients according to the age (N=100)

Age (in years)	Anemic Patients (N_1=50)	Percentage of Anemic Patients (%)	Non- Anemic Patients (N_2=50)	Percentage of Non-Anemic Patients (%)
19-21	16	32	11	22
22-24	10	20	13	26
25-27	9	18	10	20
28-30	6	12	7	14
31-33	5	10	5	10
34-36	4	8	4	8

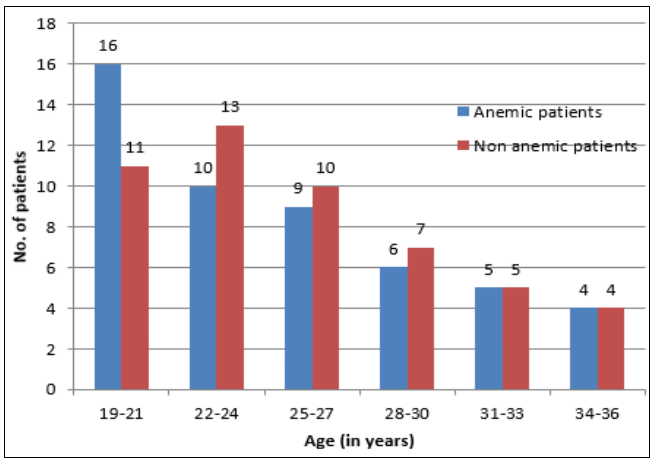
Out of 50 anemic patients, maximum of 16 patients (32%) are in between the age of 19-21 years, 10 patients (20%) are in between the age of 22-24 years, 9 patients (18%) are in between the age of 25-27 years, 6 patients (12%) are in between the age of 28-30 years, 5 patients (10%) are in between the age of 31-33 years, 4 patients (8%) in between the age group 34-36 years.

Out of 50 non-anemic patients, maximum of 13 patients (26%) are in between the age of 22-24 years, 11 patients (22%) are in between the age of 19-21 years, 10 patients (20%) are in between the age of 25-27 years, 7 patients (14%) are in between the age of 28-30 years, 5 patients (10%) are in between the age of 31-33 years, 4 patients (8%) in between the age group 34-36 years.

	Anemic Patients	Non-anemic Patients
Mean Age (In years) ± Standard Deviation	24.92 ± 4.94	25.82 ± 4.49

P Value = 0.28 (Not significant)
T Value = 1.07

In the present study, there is no significant association with the age of the patient and anemia.

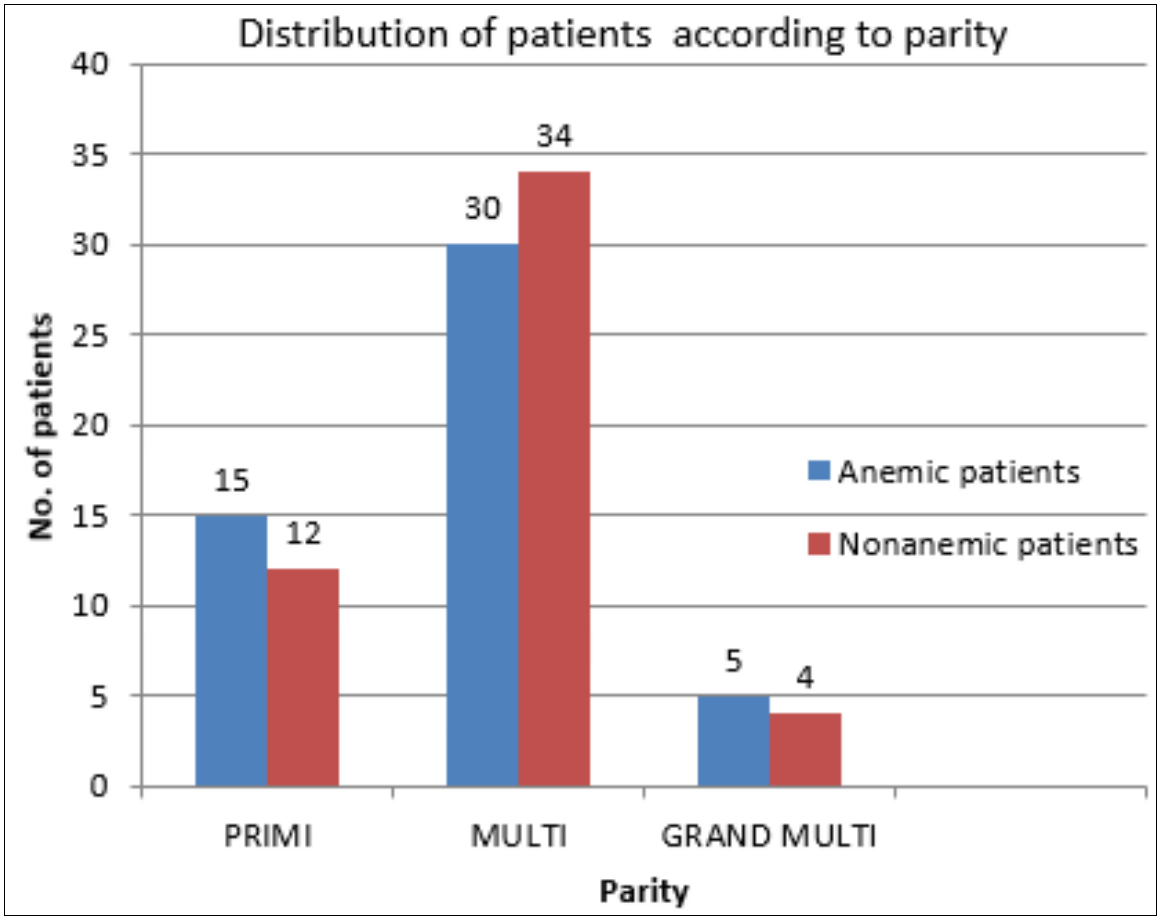


Graph 1: Distribution of patients according to the age (n=100)

Table 2: Distribution of patients according to parity (N=100)

Parity	Anemic patients (N_1=50)	Percentage of anemic patients (%)	Non- anemic patients (N_2=50)	Percentage of non-anemic patients (%)
Primiparous	15	30	12	24
Multiparous	30	60	34	68
Grand multiparous (>/=5)	5	10	4	8

Out of 50 anemic patients, 30 patients (60%) are multiparous, 15 patients (30%) are primiparous, 5 patients (10%) are grand multiparous. Out of 50 non-anemic patients, 34 patients (68%) are multiparous, 12 patients (24%) are primiparous, 4 patients (8%) are grand multiparous.



Graph 2: Distribution of patients according to parity (N=100)

Table 3: Distribution of patients according to body mass index (BMI) (N=100)

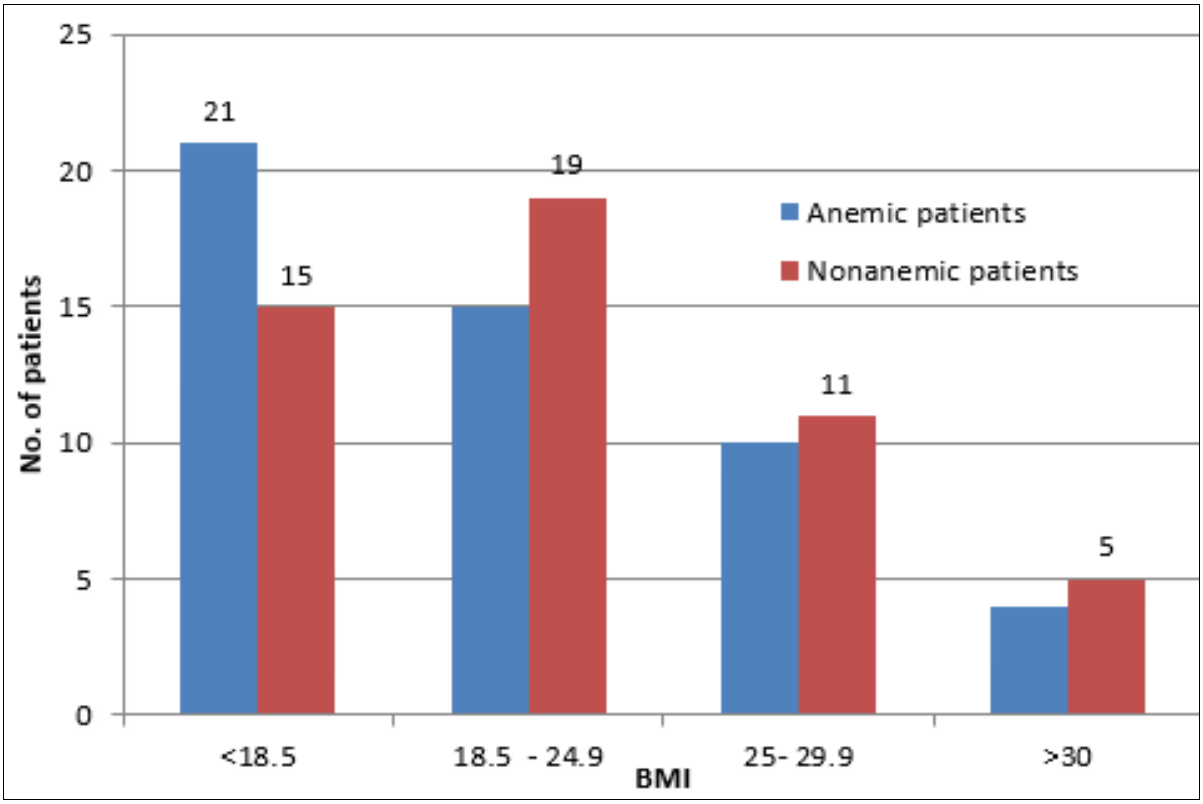
BMI (IN KG/M2)	Anemic patients (N_1=50)	Percentage of anemic patients (%)	Non-anemic patients (N_2=50)	Percentage of non-anemic patients (%)
< 18.5 (Underweight)	21	42	15	30
18.5-24.9 (Normal)	15	30	19	38
25- 29.9 (Over-weight)	10	20	11	22
> 30 (Obese)	4	8	5	10

Out of 50 anemic patients, 21 patients (42%) are underweight, 15 patients (30%) had normal BMI, 10 patients (20%) are overweight, 4 patients (8%) are obese. Out of 50 non-anemic patients, 19 patients (38%) had normal BMI, 15 patients (30%) are underweight, 11 patients (22%) are overweight, 5 patients (10%) are obese.

	Anemic patients	Non- anemic patients
Mean BMI (In Kg/m^2)± Standard Deviation	20.92 ± 4.73	22.3 ± 5.34

P Value = 0.19 (Not significant)
T Value = 1.31

In the present study, there is no significant association with the BMI of the patient and anemia.



Graph 3: Distribution of patients according to BMI (N=100)

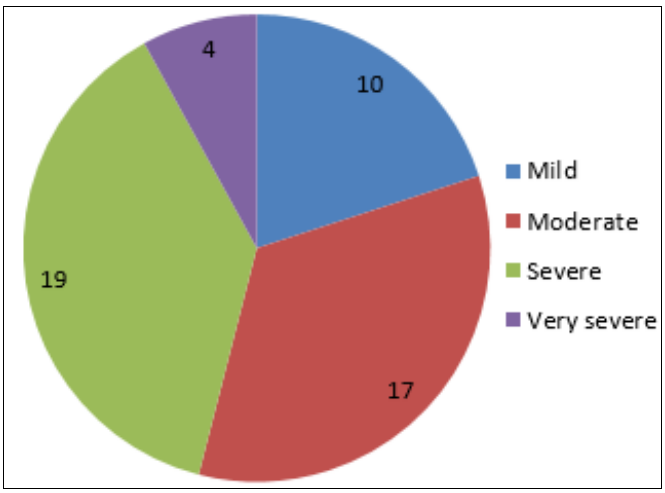
Table 4: Distribution of patients according to severity of anemia (N=50)

Anemia (Hb in gm/dl)(ICMR Classification)	Number of Patients (N=50)	Percentage of Patients (%)
Mild (10.1-10.9)	10	20
Moderate (7.1-10)	17	34
Severe (4.1-7.0)	19	38
Very Severe (</=4)	4	8

Out of 50 patients, 19 patients (38%) had severe anemia, 17 patients (34%) had moderate anemia, 10 patients (20%) had mild anemia, 4 patients (8%) had very severe anemia.

Severity of anemia	Mean Hb	Standard deviation	P Value
Mild	10.33	0.19	< 0.0001 (Significant)
Moderate	8.41	0.99	
Severe	5.78	0.95	
Very severe	3.62	0.47	

The mean Hb of mild anemia is 10.33g/dl, moderate anemia is 8.41g/dl, severe anemia is 5.78g/dl and very severe anemia is 3.62g/dl and P Value is < 0.0001 which is very significant.



Graph 4: Distribution of patients according to severity of anemia (N=50)

Table 5: Distribution of patients according to maternal outcomes (N=100)

Maternal Outcome	Anemic Patients (N_1=50)	Percentage of Anemic Patients (%)	Non- Anemic Patients (N_2=50)	Percentage of Non-Anemic Patients (%)	P Value
Preterm delivery	16	32	3	6	0.002
Delayed wound healing	13	26	2	4	0.002
Lactational failure	9	18	2	4	0.020

Out of 50 anemic patients, distribution according to maternal outcomes was 16 patients (32%) had preterm delivery, 13 patients (26%) had delayed wound healing, 9 patients (18%) had lactational failure and there are no cases of venous thrombosis, postpartum haemorrhage, subinvolution, puerperal sepsis and no maternal death. Out of 50 non-anemic patients, distribution according to maternal outcomes was 3 patients (6%) had preterm delivery, 2 patients (4%) had delayed wound healing, 2 patients (4%) had lactational failure and there are no cases of intrauterine death, postpartum haemorrhage, puerperal sepsis and no maternal death.

When preterm delivery outcome is compared among two groups of anemic and non- anemic patients, P Value is 0.002, which is significant.

When delayed wound healing outcome is compared among two groups of anemic and non-anemic patients, P Value is 0.002, which is significant.

When lactational failure outcome is compared among two groups of anemic and non- anemic patients, P Value is 0.020, which is significant.

Table 6: Distribution of patients according to neonatal outcomes (n= 100)

Neonatal outcome	Anemic patients (N=50)	Percentage of anemic Patients (%)	Non- anemic patients (N=50)	Percentage of non-anemic Patients (%)
Low Birth Weight (LBW)	20	40	9	18
Intrauterine Growth Restriction (IUGR)	17	34	9	18
Intrauterine Death (IUD)	2	4	1	2
Low Apgar Scores	19	38	1	2
Neonatal Sepsis	7	14	2	4

P Value = 0.02, Chi-square Value = 7.20

Out of 50 anemic patients, distribution according to neonatal outcomes was 20 patients (40%) had low birth weight, 19 patients (38%) had low APGAR scores, 17 patients (34%) had IUGR, 7 patients (14%) had neonatal sepsis, 2 patients (4%) had intrauterine death and no cases of neonatal anemia and neonatal death. Out of 50 non-anemic patients, distribution according to neonatal outcomes was 9 patients (18%) had low birth weight, 9 patients (18%) had IUGR, 1 patient (2%) had low APGAR score and no cases of neonatal sepsis, neonatal anemia and neonatal death.

Table 7: Distribution of patients with mild anemia according to maternal outcomes (n=10)

Maternal Outcome	Number of Patients (N=10)	Percentage of Patients (%)
Intrauterine Growth Restriction (IUGR)	1	10
Delayed Wound Healing	1	10

Out of 10 patients with mild anemia, distribution according to maternal outcomes,1 patient (10%) had IUGR, 1 patient (10%) had delayed wound healing, no IUD, preterm delivery, lactational failure, puerperal sepsis, postpartum haemorrhage, maternal death.

Table 8: Distribution of patients with mild anemia according to neonatal outcomes (N=10)

Neonatal outcome	Number of patients (N=10)	Percentage of patients (%)
Low birth weight (lbw)	2	20
Low apgar scores	2	20

Out of 10 patients with mild anemia, distribution according to neonatal outcomes was 2 patients (20%) had low birth weight, 2 patients (20%) had low APGAR scores, no neonatal sepsis, neonatal anemia, neonatal death.

Table 9: Distribution of patients with moderate anemia according to maternal outcomes (N=17)

Maternal outcome	Number of Patients (N=17)	Percentage of Patients (%)
Intrauterine growth restriction (Iugr)	5	29.41
Preterm delivery	5	29.41
Delayed wound healing	2	11.76

Out of 17 patients with moderate anemia, distribution according to maternal outcomes was 5 patients (29.41%) had IUGR, 5 patients (29.41%) had preterm delivery, 2 patients (11.76%) had delayed wound healing, no IUD, lactational failure, puerperal sepsis, postpartum haemorrhage, maternal death.

Table 10: Distribution of patients with moderate anemia according to neonatal outcomes (N=17)

Neonatal outcome	Number of Patients (N=17)	Percentage of Patients (%)
Low birth weight (lbw)	6	35.29
Low apgar scores	6	35.29

Out of 17 patients with moderate anemia, distribution according to neonatal outcomes was 6 patients (35.29%) had low birth weight, 6 patients (35.29%) had low APGAR scores, no neonatal sepsis, neonatal anemia, neonatal death.

Table 11: Distribution of patients according to maternal outcomes in severe anemia (N=19)

Maternal outcome	Number of Patients (N=19)	Percentage of Patients (%)
Intrauterine growth restriction (IUGR)	7	36.84
Intrauterine death (IUD)	1	5.26
Preterm delivery	7	36.84
Delayed wound healing	7	36.84
Lactational failure	6	31.57

Out of 19 patients with severe anemia, distribution according to maternal outcomes was 7 patients (36.84%) had IUGR, 7 patients (36.84%) had preterm delivery, 7 patients (36.84%) had delayed wound healing, 6 patients (31.57%) had locational failure, 4 patients (21.05%) had neonatal sepsis, 1 patient (5.26%) had intrauterine death, no puerperal sepsis, postpartum haemorrhage, maternal death.

Table 12: Distribution of patients according to neonatal outcomes in severe anemia (N=19)

Neonatal Outcome	Number of Patients (N=19)	Percentage of Patients (%)
Low birth weight (lbw)	8	42.10
Low apgar scores	7	36.84
Neonatal sepsis	4	21.05

Out of 19 patients with severe anemia, distribution according to neonatal outcomes was 8 patients (42.10%) had low birth weight, 7 patients (36.84%) had low APGAR scores, 4 patients (21.05%) had neonatal sepsis, no neonatal anemia, neonatal death.

Table 13: Distribution of patients according to maternal outcomes in very severe anemia (N=4)

Maternal outcome	Number of Patients (N=4)	Percentage of Patients (%)
Intrauterine growth restriction (IUGR)	4	100
Intrauterine death (IUD)	1	25
Preterm delivery	4	100
Delayed wound healing	3	75
Lactational failure	3	75

Out of 4 patients with very severe anemia, distribution according to maternal outcomes, 4 out of 4 patients (100%) had IUGR, preterm delivery, 3 out of 4 patients (75%) had delayed wound healing, lactational failure, 1 out of 4 patients (25%) had intrauterine death, no puerperal sepsis, postpartum haemorrhage, maternal death.

Table 14: Distribution of patients according to neonatal outcomes in very severe anemia (N=4)

Neonatal outcome	Number of Patients (N=4)	Percentage of Patients (%)
Low birth weight (LBW)	4	100
Low apgar scores	4	100
Neonatal sepsis	3	75

Out of 4 patients with very severe anemia, distribution according to perinatal outcomes was 4 out of 4 patients (100%) had low birth weight, low APGAR scores.3 out of 4 patients (75%) had neonatal sepsis, no neonatal anemia, neonatal death.

Discussion

In the present study mean age (in years) of anemic population is 24.92 ± 4.94 and mean age (in years) of non-anemic population is 25.82 ± 4.49, P-Value of 0.28 which is not significant, while the study conducted by Karasahin *et al.* [8] showed mean age (in years) of anemic population is 28.3 ± 4.1 and mean age (in years) of non-anemic population is 27.6 ± 3.8 and P Value is not significant.

In the present study out of 50 anemic patients, 30 patients (60%) are multiparous, 15 patients (30%) are primiparous, 5 patients (10%) are grand multiparous. Out of 50 non-anemic patients, 34 patients (68%) are multiparous, 12 patients (24%) are primiparous, 4 patients (8%) are grand multiparous. While the study conducted by Chu FC *et al.* [9] from 2001 to 2016, 8565 (54.9%) are primiparous in test cohort and 7203 (55.3%) are primiparous in study cohort and P Value is 0.05 which is not significant.

In the present study mean BMI (in Kg/m^2) of anemic population is 20.92 ± 4.73 and mean BMI (in Kg/m^2) of non-anemic population is 22.3 ± 5.34, P-Value of 0.19 which is not significant, while the study conducted by Karasahin *et al.* [8] showed mean BMI (in Kg/m^2) of anemic population is 23.6 ± 2.6 and mean BMI (in Kg/m^2) of non-anemic population is 23.2 ± 2.4 and P Value is not significant. However, the study conducted by Patel A *et al* [10] indicated the prepregnancy BMI < 18.5 Kg/m2 was a predictor of anemia, due to inadequate nutrition in pregnancy. But this association is not found in our study which might be due to variations in study participants and methods involved.

In this study, when maternal outcomes are associated with anemia, P Value is 0.03 (significant), chi-square value is 10.45, hence there is significant association of anemia with maternal outcomes such as preterm birth, which is comparable to the study conducted by Lin L *et al.* [11] and Haider BA *et al.* [12] where they found that women with anemia are at higher risk of developing adverse maternal outcomes.

In this study, when neonatal outcomes are associated with anemia, P Value is 0.02 (significant), chi-square value is 7.20, hence there is significant association of anemia with maternal outcomes such as low birth weight, NICU admissions which is comparable to the study conducted by Drukker L *et al.* [13] and Tunkyi K *et al.* [14] where they found that women with anemia are at higher risk of developing adverse neonatal outcomes.

In this study, in patients with very severe anemia 100% showed IUGR, preterm delivery, 75% had delayed wound healing, lacatational failure and 25% had IUD, this is comparable to the study conducted by Kumari S *et al* [15] in which risk of preterm birth, low birth weight are strongly associated with increased severity of anemia.

Summary

- Among 50 anemic patients, maximum of 16 patients (32%) are in between the age of 19-21 years, 10 patients (20%) are in between the age of 22-24 years, 9 patients (18%) are in between the age of 25-27 years, 6 patients (12%) are in between the age of 28-30 years, 5 patients (10%) are in between the age of 31-33 years, 4 patients (8%) in between the age group 34-36 years. Among 50 non-anemic patients, maximum of 13 patients (26%) are in between the age of 22-24 years, 11 patients (22%) are in between the age of 19-21 years, 10 patients (20%) are in between the age of 25-27 years, 7 patients (14%) are in between the age of 28-30 years, 5 patients (10%) are in between the age of 31-33 years, 4 patients (8%) in between the age group 34-36 years.
- Out of 50 anemic patients, 30 patients (60%) are multiparous, 15 patients (30%) are primiparous, 5 patients (10%) are grand multiparous. Out of 50 non-anemic patients, 34 patients (68%) are multiparous, 12 patients (24%) are primiparous, 4 patients (8%) are grand multiparous.
- Among 50 anemic patients, 21 patients (42%) are underweight, 15 patients (30%) had normal BMI, 10 patients (20%) are overweight, 4 patients (8%) are obese. Among 50 non-anemic patients, 19 patients (38%) had normal BMI, 15 patients (30%) are underweight, 11 patients (22%) are overweight, 5 patients (10%) are obese.
- In this study of 50 patients, 10 of them had mild anemia (20%), 17 of them had moderate anemia (34%), 19 of them had severe anemia (38%), 4 of them had very severe anemia (8%).
- Distribution according to maternal outcomes, out of 50 anemic patients, 16 patients (32%) had preterm delivery, 13 patients (26%) had delayed wound healing, 9 patients (18%) had lactational failure. There are no cases of postpartum haemorrhage, puerperal sepsis and no maternal death. Out of 50 non-anemic patients, 3 patients (6%) had preterm delivery. There are no cases of delayed wound healing, lactational failure, postpartum haemorrhage, puerperal sepsis and no maternal death.
- In this study of 50 anemic patients, distribution according to neonatal outcomes was 20 patients (40%) had low birth weight, 19 patients (38%) had low APGAR scores, 17 patients (34%) had IUGR, 7 patients (14%) had neonatal sepsis, 2 patients (4%) had intrauterine death and no cases of neonatal anemia and neonatal death. Out of 50 non-

anemic patients, 4 patients (8%) had low birth weight, 4 patients (8%) had IUGR, 1 patient (2%) had low APGAR score and no cases of intrauterine death, neonatal anemia, neonatal sepsis and neonatal death.

- Among 50 anemic patients, 2 of them had IUD (4%), 48 patients had live births (96%).Out of 48 live births, 20 of them (41.66) had low-birth weight babies,17 of them (35.41%) had IUGR, 16 of them (33.33%) had preterm delivery, 19 of them (39.58%)low APGAR scores, 13 of them (27.08%) delayed wound healing, 9 of them (18.75%) had lactational failure and 7 of them (14.58%) had neonatal sepsis.
- Out of 10 patients with mild anemia, distribution according to maternal outcomes,1 patient (10%) had IUGR, 1 patient (10%) had delayed wound healing, no IUD, preterm delivery, lactational failure, puerperal sepsis, postpartum haemorrhage, maternal death. Distribution according to neonatal outcomes was 2 patients (20%) had low birth weight, 2 patients (20%) had low APGAR scores, no neonatal sepsis, neonatal anemia, neonatal death.
- Out of 17 patients with moderate anemia, distribution according to maternal outcomes was 5 patients (29.41%) had IUGR, 5 patients (29.41%) had preterm delivery, 2 patients (11.76%) had delayed wound healing, no IUD, lactational failure, puerperal sepsis, postpartum haemorrhage, maternal death. Distribution according to neonatal outcomes was 6 patients (35.29%) had low birth weight, 6 patients (35.29%) had low APGAR scores, no neonatal sepsis, neonatal anemia, neonatal death.
- Out of 19 patients with severe anemia, distribution according to maternal outcomes was 7 patients (36.84%) had IUGR, 7 patients (36.84%) had preterm delivery, 7 patients (36.84%) had delayed wound healing, 6 patients (31.57%) had locational failure, 4 patients (21.05%) had neonatal sepsis, 1 patient (5.26%) had intrauterine death, no puerperal sepsis, postpartum haemorrhage, maternal death. Distribution according to neonatal outcomes was 8 patients (42.10%) had low birth weight, 7 patients (36.84%) had low APGAR scores, 4 patients (21.05%) had neonatal sepsis, no neonatal anemia, neonatal death.
- Out of 4 patients with very severe anemia, distribution according to maternal outcomes, 4 out of 4 patients(100%) had IUGR, preterm delivery, 3 out of 4 patients(75%) had delayed wound healing, lactational failure, 1 out of 4 patients (25%) had intrauterine death, no puerperal sepsis, postpartum haemorrhage, maternal death. Distribution according to neonatal outcomes was 4 out of 4 patients (100%) had low birth weight, low APGAR scores, 3 out of 4 patients (75%) had neonatal sepsis. There are no cases of neonatal anemia, neonatal death

Conclusion

Anemia is significantly associated with adverse maternal and neonatal outcomes and as the severity of anemia is increased, its adverse effects are even worse. Routine iron and folic acid, micronutrient supplementation regularly and whenever indicated parenteral iron infusions or blood transfusions must be done during pregnancy which prevents such adverse outcomes and has beneficial effects on the pregnancy outcome. Therefore, it is necessary for identification of anemia antenatally, prompt treatment for correction of anemia and measures to reduce the incidence of anemia in pregnancy to prevent adverse maternal and neonatal outcomes.

Conflict of Interest
Not available

Financial Support
Not available

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