

Effect of Anemia in Pregnancy and its Perinatal Outcome: A Prospective Cohort Study

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ABSTRACT:

Introduction: Anemia is a major risk factor for poor maternal health status. Anemia during pregnancy leads to poor birth outcomes such as fetal anemia, low birth weight, preterm birth, stillbirth, and neonatal mortality. This study aimed to assess the effect of anemia in pregnancy and its perinatal outcome. **Methods:** A prospective study was conducted among 370 pregnant women in Dhulikhel Hospital, Kavre from June 2017 to December 2017. Descriptive statistics were used to represent the socio-clinical characteristics. Bivariate analysis was performed to analyze the effect of anemia. **Results:** The study found that all the participants were anemic out of which mild anemia was observed in 352 (95.4%), moderate anemia in 17 (4.6%), and severe anemia in one (0.3%) participants respectively. Women aged 17 to 24 years and multiparous women had higher odds of having moderate anemia (Hb 7.0-8.9 g/dL). Women with moderate anemia had more odds of having neonates with less Apgar scores. Women with moderate anemia had nine times higher odds of having newborn mortality. **Conclusion:** Anemia during pregnancy not only affects the health status of the mother but also impacts the birth outcomes. This study highlighted the emphasis on the active participation of governmental and non-governmental organizations to prevent adverse effects of anemia during pregnancy and birth outcomes.

Keywords: Anemia; Birth outcomes; Mortality; Perinatal; Pregnancy

INTRODUCTION:

Anemia is a critical public health problem affecting the developed as well as developing world. [1] Anemia is the condition in which the number of red blood cells or their oxygen-carrying capacity is inadequate to meet the physiologic needs. Anemia in pregnancy has been defined by World Health Organization (WHO) as the hemoglobin (Hb) concentration less than 11 g/dL where Hb less than 9.0-10.9 g/dL is mild anemia, 7.0-8.9 g/dL is

moderate anemia and Hb less than 7.0 g/dL is severe anemia.[2]

As per WHO, it has been estimated that globally 40% of pregnant women are anemic.[3] Iron deficiency anemia during pregnancy is one of the major public health problems.[4] There are multifactorial causes of anemia during pregnancy that include, micronutrient deficiencies of iron, folate due to parasitic infections such as malaria and hookworm, or chronic infections like TB and HIV. [5] Studies have shown that 56% of pregnant women globally belong to low and middle-income countries (LMIC).[6] Southeast Asia has a 48% of prevalence of anemia after Sub-Saharan Africa (SSA). Anemia prevalence during pregnancy is highest in India (87%), Bangladesh (77%), Nepal (65%), Sri-Lanka (60%), and Bhutan (59%).[7]

Submitted: 26 May, 2021

Accepted: 06 October, 2021

Published: 17 November, 2021

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How to cite this article:

Pradhan N, Tamrakar SR, Karmacharya SB. Effect of Anemia in Pregnancy and its Perinatal Outcome: A Prospective Cohort Study.. Journal of Lumbini Medical College. 2021;9(2):6 pages. DOI: <https://doi.org/10.22502/jlmc.v9i2.445>. Epub: November 17, 2021.



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As per Nepal Demographic Health Survey (NDHS, 2016), 41% of the women aged 15 to 49 years are anemic. Even though the prevalence of anemia among pregnant women had slightly declined from 48 % to 46% it is still a public health problem in context of Nepal.[8] Anemia during pregnancy leads to a burden in maternal morbidity, mortality, and poor birth outcomes such as fetal anemia, low birth weight (LBW), preterm birth, and stillbirth. [9,10]

Very few studies have been conducted in Dhulikhel hospital to identify the incidence and outcome of anemia during pregnancy. The outcomes of this study would help to focus on educating people for the need or correction of anemia before pregnancy.

METHODS:

A prospective cohort study was conducted from June 2017 to December 2017 to identify the perinatal outcome of anemia during pregnancy. The study was conducted among pregnant women who attended the Dhulikhel hospital Out-patient Department (OPD), labor room, and emergency after the approval of Institutional Review Committee (IRC) (approval number:97/17). Pregnant women who were identified with anemia, aged between 17–35 years with singleton pregnancy and gravida three or less were included in this study. Classification of anemia was done according to World Health Organisation (WHO) definition of anemia as the hemoglobin (Hb) concentration less than 11 g/dL where Hb less than 9.0-10.9 g/dL is mild anemia, 7.0 -8.9 g/dL is moderate anemia and Hb less than 7.0 g/dL is severe anemia.

The sample size of this study was determined by the Cochran formula, with the proportion (prevalence of anemia during pregnancy) 46%, 5% precision, and 95% confidence interval, which was calculated as 339. The final sample size with a 10% non-response rate was 370. All the patients fulfilling the inclusion criteria were included in the sample.

The hematological examination of the pregnant women was conducted in third trimester and followed till delivery. The patient was provided with informed consent before enrolling the patient in the study. The hematological analysis was done in the lab of Dhulikhel hospital. Data were collected and analyzed after the IRC clearance was obtained for the research.

The collected data was entered on Microsoft Excel and exported and analyzed in SPSS. Descriptive statistics were used to summarize data while bivariate logistic regression analysis was performed to analyze the effect of anemia. The association between anemia during pregnancy and independent variables such as adverse perinatal outcomes were assessed by calculating the Odds Ratio (OR) at 95% Confidence Interval (CI). Here, P-value < 0.05 was considered as statistically significant.

RESULTS:

A total of 467 pregnant women were identified with anemia during the study among 1864 pregnant women who visited OPD, labor room and emergency room of Dhulikhel hospital between June to December 2017. Out of them 370 mothers were selected as per the sample size and inclusion criteria.

Table 1 Socio-Clinical characteristics of study participants (n=370).

Variable Name	N (%)
Age in years(N=352)* (Mean±SD)	24.9±4.61
17 to 24	203 (57.7%)
25 to 35	149 (42.3%)
Parity*	
Nullipara	222(60.2%)
Primipara	109(29.5%)
Multipara	38 (10.3%)
Booking*	
Unbooked	148 (41.2%)
Booked	217 (58.8%)
Anemia	
Severe(<7g/dl)	1 (0.3%)
Moderate(7-8.9 g/dL)	17 (4.6%)
Mild (9-10.9 g/dL)	352 (95.1%)
Risk Factor*	
No	347 (88.5%)
Yes	22 (6.3%)
Mode of delivery*	
Vaginal	258 (69.9%)
LSCS	111 (30.1%)

**Variables with missing information*

Table 2 Association between socio-clinical characteristics with the severity of anemia.

Variable Name	Severity of anemia		p-value	
	Moderate	Mild		
Maternal Age (N=352)	17 to 24 years	10(58.8%)	193(57.6%)	0.921
	25 to 35 years	7(41.2%)	142(42.4%)	
Parity	Nullipara	8(47.1%)	214(60.8%)	0.17
	Primipara	5(29.4%)	104(29.5%)	
	Multipara	4(23.5%)	34(9.7%)	
Registration Status	Booked	8(47.1%)	209(59.4%)	0.314
	Unbooked	9(52.9%)	143(40.6%)	
Mode of Delivery	Normal	9(52.90%)	249(70.70%)	0.118
	LSCS	8(47.1%)	103(29.3%)	
Birth Weight (grams)	Less than 2500	4(23.5%)	51(14.5%)	0.303
	2500-3500	13(76.5%)	270(76.7%)	
	More than 3500	0(0.0%)	31(8.8%)	
Preterm	No	14(82.4%)	310(88.1%)	0.482
	Yes	3(17.6%)	42(11.9%)	
Apgar Score < 6 at 1 minute	No	13(76.5%)	344(97.7%)	<0.001
	Yes	4(23.5%)	8(2.3%)	
Apgar Score < 6 at 5 minute	No	15(88.23%)	348(98.86%)	<0.001
	Yes	2(11.76)%	4(1.13)%	
NICU Stay	No	16(94.1%)	339(96.3%)	0.644
	Yes	1(5.9%)	13(3.7%)	
Newborn mortality	No	15(88.2%)	347(98.6%)	0.002
	Yes	2(11.8%)	5(1.4%)	

Chi-square test

Table 3. Social and clinical characteristics associated with anemia in pregnancy (n=369)

Variables		Moderate Anemia (Hb 7.8-9.0 g/dl) N(%)	Mild Anemia (Hb 9.0-10.9g/dl) N(%)	Unadjusted OR (95% CI)	p-value
Age (years)	25 to 35	7(41.2%)	142(42.4%)	1	0.921
	17 to 24	10(58.8%)	193(57.6%)	1.05(0.39-2.82)	
Parity	Primipara	5(29.4%)	104(29.5%)	1	0.666
	Nullipara	8(47.1%)	214(60.8%)	0.77(0.24-2.43)	
	Multipara	4(23.5%)	34(9.7%)	2.44 (0.62-9.63)	
Booking*	Unbooked	8(50.0%)	140(40.1%)	1	0.318
	Booked	8(50/0%)	209(59.9%)	0.60(0.22-1.61)	

*Variable with missing values

Table 1 shows that mild anemia was observed in 352 (95.4%) participants followed by moderate 17 (4.6%) and severe one (0.3%) respectively. Out of the total participants, a few 22 (5.9%) had the presence of risk factors such as pre-eclampsia and hypothyroidism. The majority of the participants 258 (69.9%) had vaginal delivery followed by LSCS 111 (30.1%).

Table 2 shows that moderate anemia was seen more among the age group of 17 to 24 years but the association was not statistically significant. It was observed that moderate anemia was more in participants with Apgar Score < 6 at 1 minute and this association was statistically significant ($p < 0.001$). Similarly, moderate anemia was observed more in participants with Apgar Score < 6 at 5 minutes which was also statistically significant ($p = 0.01$). The moderate anemia was also observed more in participants with newborn mortality and this association was statistically significant ($p = 0.002$). Other factors like parity, registration status, mode of delivery, birth weight, preterm birth, and NICU stay were assessed but no association was found between severity of anemia during pregnancy.

Table 3 shows an association between anemia and the predictor variables. Women aged 17 to 24 had 5% higher odds of having moderate anemia. Multiparous women had 2.5 times higher odds of having moderate anemia (OR; 2.44; 95%

CI 0.62-9.63) in comparison to primipara. The women who had booked the services at Dhulikhel hospital had 40% fewer odds of having moderate anemia (OR; 0.60; 95% CI 0.22-1.61). However all of the mentioned association was not statistically significant.

Birth outcomes associated with anemia during pregnancy

Women delivering a baby with Apgar <6 at 1 minute had 13 times higher odds of having moderate anemia (OR: 13.23, 95% CI: 3.52-49.61) with significance ($p = 0.001$). Women delivering a baby with Apgar <6 at 5 minutes had 11 times more odds of having moderate anemia (OR: 11.60, 95% CI: 1.96-68.39) with significance ($p = 0.007$). Women having moderate anemia during pregnancy had 9.25 times higher odds of having neonatal mortality (OR: 9.25, 95% CI: 1.65-51.64) with a significance of ($p = 0.011$). Other factors like mode of delivery, preterm birth, low birth weight, and NICU stay were assessed but no association was found between mild and moderate anemia during pregnancy.

DISCUSSION:

Anemia is a common issue in pregnant women in lower middle-income countries like Nepal. Many similar studies have been conducted to observe the pregnancy outcomes in anemic pregnant women.[5,11,12] Our study was conducted among

Table 4. Birth outcomes associated with anemia during pregnancy (n=369)

Variables		Moderate Anemia N(%)	Mild Anemia N(%)	Unadjusted OR (95% CI)	p value
Mode of delivery	Vaginal	9(52.9%)	249(69.9%)	1	0.126
	LSCS	8(47.1%)	103(29.3%)	2.14(0.80-5.72)	
Preterm	No	14(82.4%)	310(88.1%)	1	0.485
	Yes	3(17.6%)	42(11.9%)	1.58(0.43-5.73)	
Low Birth Weight	No	13(76.5%)	301(85.5%)	1	0.313
	Yes	4(23.5%)	51(14.5%)	1.81(0.57-5.78)	
Apgar <6 at 1 Minute	No	13(76.5%)	344(97.7%)	1	0.0001
	Yes	4(23.5%)	8(2.3%)	13.23(3.52-49.61)	
Apgar <6 at 5 Minute	No	15(88.2%)	348(98.9%)	1	0.007
	Yes	2(11.8%)	4(1.1%)	11.60(1.96-68.39)	
NICU Stay	No	16(94.1%)	339(96.3%)	1	0.648
	Yes	1(5.9%)	13(3.7%)	1.63(0.20-13.24)	
Newborn mortality	No	15(88.2%)	347(98.6%)	1	0.011
	Yes	2(11.8%)	5(1.4%)	9.25(1.65-51.64)	

participants in the third trimester.

The present study findings showed that all the participants were anemic. While the majority of them were mild anemic, only one was severely anemic. A study by Mulepati et al. found that anemia was highly prevalent in women in the third trimester while another study showed that prevalence was higher in pregnant women in the second trimester. [12,13] A study by Lamichhane et al. presented that the majority of participants were moderately anemic while no severe cases of anemia were identified.[14] This was also consistent with the study by Ahmad & Kalsoom.[15] However, it should be noted that all the participants of the present study were found anemic. This difference might be due to difference in the sample size and study settings.

Our study found that the severity of anemia prevalence was more in participants aged 17 to 24 years which can be due to majority of the participants belonged to the same age group. Similar findings were presented in the study by Sharma et al, which showed that low-aged women were more anemic.[16] In the present study, 58% of the women were booked cases which were similar to the study by Upadhyay et al.[11] The same study showed that anemia during pregnancy was more common in multipara women which was contrasted in the present study because the mild anemia was more common in nullipara women which can be due to more participants between the age of 17 to 24 years in the study. Similar findings observed in another study showed 1.3 times more odds of having anemia.[5] Such similar result can be due to the similar representation of age group of participants.

The current study showed an association between anemia and birth outcomes such as Apgar scores and newborn mortality. Association between anemia and Apgar score of less than six at 1 minute was observed in another study.[15] Cakmak et al. depicted that the low Apgar scores were significantly more prevalent among women with abnormal Hb levels in third trimesters of pregnancy which was similar to the present study with low Apgar scores highest in women having moderate anemia.[17] A study by Lone et al. showed women having moderate anemia had 1.8 times increased risk of having Apgar score less than 5 at 1 min while women in the present study had 13.23 times higher risk of having Apgar score of less than 6 at 1 min.[18]

Also, in present study anemia and mode

of delivery were not statistically significant. But findings presented in another study, cesarean delivery showed 4.8 times higher risk of anemia.[19]

A high incidence of the birth outcome in the form of low birth weight, preterm births, and NICU stay was seen in the present study but these outcomes were not statistically significant with anemia in our study. These outcomes were also not found to be statistically associated with anemia in the study by Stephen et al.[5]

CONCLUSION:

The high prevalence of anemia during pregnancy in this study implies that maternal anemia is an important public health problem in middle-income countries like Nepal. Anemia during pregnancy not only affects the health status of the mother but also impacts birth outcomes. This study highlighted the emphasis on the active participation of governmental and non-governmental organizations to prevent adverse effects of anemia during pregnancy and birth outcomes.

Conflict of Interest: The authors declare that no competing interests exist.

Financial Disclosure: No funds were available.

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