PRETERM DELIVERY AND LOW BIRTH WEIGHT IN PREGNANT WOMEN WITH ANEMIA (MATERNAL ANEMIA) AT SHAIKH ZAID HOSPITAL, SMBBMU LARKANA

Dr. Khushboo[*1], Dr. Shaista Tabassum[2], Dr Iqra Ashraf[3], Dr Rasheeda Parveen[4], Dr Sumera Brohi[5], Dr. Sidra Ghori[6]

[1,2,3,4,5]Shaikh Zaid Women Hospital Shaheed Mohtarma Benazir Bhutto Medical University Larkana
[6]Indus Medical College, Tando Muhammad Khan

[*1]khushiali477@gmail.com

Corresponding Author: *
Dr. Khushboo

Abstract

BACKGROUND: Anemia during pregnancy poses a serious health risk, as it increases the likelihood of complications such as premature delivery and babies being born with low birth weight. The more severe the anemia, the greater the risk to both mother and baby.

OBJECTIVE: This study aimed to assess how often preterm birth and low birth weight occur among anemic pregnant women receiving care at Shaikh Zaid Women Hospital, SMBBMU Larkana.

STUDY DESIGN: Descriptive cross-sectional study.

SETTING: Department of Obstetrics and Gynecology, Shaikh Zaid Women Hospital, SMBBMU Larkana.

STUDY DURATION: Six months, from Nov 14, 2024, to May 13, 2025.

SAMPLING TECHNIQUE: Non-probability consecutive sampling

SAMPLE SIZE: A total of 152 pregnant women diagnosed with anemia were included.

SUBJECTS AND METHODS: Women between the ages of 18 and 45 years, whether experiencing their first pregnancy or having had previous births, and with gestational ages between 28 and 42 weeks (determined by the last menstrual period), were enrolled. All participants had confirmed maternal anemia. Data were analyzed using descriptive statistics means and standard deviations for continuous variables and frequencies and percentages for categorical variables.

RESULTS: Preterm delivery was observed in 84 women (55.2%), while 68 babies (44.7%) were born with low birth weight. A majority of participants were from urban areas (52.0%) and had no formal education (28.9%). Most were unbooked (67.1%) and multiparous (56.6%). The lower socioeconomic group accounted for 41.4% of the sample. Other notable findings included the presence of smoking (36.8%), obesity (55.9%), NICU admissions (32.9%), stillbirths (56.2%), hypertension (52.6%), diabetes (64.5%), early neonatal deaths (55.9%), low Apgar scores (61.8%), and pre-eclampsia (60.5%). Statistically significant associations with preterm delivery and low birth weight were found for maternal age (p = 0.02), place of residence (p = 0.03), socioeconomic status (p < 0.01), obesity (p = 0.04), antenatal care status (p < 0.01), diabetes (p < 0.01), NICU

admission (*p* < 0.01), hypertension (*p* = 0.01), low Apgar score (*p* < 0.01), and pre-eclampsia (*p* < 0.01). However, no significant links were observed with educational level (*p* = 0.49), smoking (*p* = 0.72), parity (*p* = 0.42), stillbirth (*p* = 0.61), or early neonatal death (*p* = 0.73).

CONCLUSION: *Maternal anemia continues to be a major contributor to unfavorable pregnancy outcomes such as preterm delivery and low birth weight. Addressing this issue through early detection and management is essential to improving maternal and neonatal health.*

INTRODUCTION

Anemia remains one of the most common nutritional deficiencies globally, affecting nearly one-third of the population (Holness N, 2018).Its impact is particularly pronounced among pregnant women, where the prevalence is even higher (Stephen G et al, 2018). The World Health Organization (WHO) defines anemia in pregnancy as having a hemoglobin level below 11 g/dL and a hematocrit value under 33% at term (Baradwan S et al, 2018 and Ghimire RH et al, 2013). Studies have shown that up to 65% of women attending antenatal clinics are affected by anemia, making it a significant public health concern that warrants immediate attention.

Maternal anemia has been linked to a range of unfavorable pregnancy outcomes (Kidanto HL et al, 2009). The severity of anemia often influences the degree of risk involved. Both mother and baby can experience complications, with preterm labor and low birth weight (LBW) being among the most common (Qiao Y et al, 2024 & Pradhan S et al, 2023). This condition compromises the amount of hemoglobin available to carry oxygen, leading to reduced oxygen delivery to the uterus, placenta, and fetus (Charan GS et al, 2023). As a result, there is dysfunction at the cellular and placental levels, which hinders fetal growth and development (Engidaw MT et al, 2022).

A newborn is considered low birth weight if the baby weighs less than 2.5 kg at term. These babies face a higher risk of illness and death in the neonatal period. Globally, LBW contributes to about four million infant deaths annually (Rosa-Mangeret F et al, 2022). A study conducted in a district hospital in Karnataka found that the prevalence of low birth weight among anemic mothers was 36%, compared to 15.3% in non-anemic mothers (Ganesh-Kumar S et al, 2010).

Infants born with low birth weight are more likely to face complications such as breathing difficulties, due to delayed clearance of lung secretions and a lack of surfactant (Thapa P et al, 2022). Other risks include electrolyte imbalances, neurodevelopmental issues, and delays in the natural closure of fetal circulatory shunts. The situation is further aggravated if maternal anemia is moderate or severe (Biradar B et al, 2023).

While there is considerable evidence linking maternal anemia with negative birth outcomes, not all studies agree on the extent of this association (Kabir MA et al, 2022). However, a consistent pattern has been observed where lower hemoglobin levels, particularly closer to delivery, are associated with higher chances of preterm births and LBW (Alem AZ et al, 2023).

In Pakistan, the burden of anemia in pregnant women remains alarmingly high. One study reported that preterm births and LBW among anemic mothers occurred at rates of 26.2% and 32.5%, respectively (Ahmad U et al, 2022). Another study by Kumari S and colleagues found similar results, with 34.75% of births being preterm and 32.81% of babies born with low birth weight (Kumari S et al, 2019).

Despite these alarming statistics, there is a noticeable gap in comprehensive research that evaluates the relationship between maternal anemia and adverse outcomes like preterm delivery and low birth weight across varied regions and socioeconomic settings. Especially in underrepresented areas such as Larkana, robust studies are limited.

This study was therefore initiated to estimate the extent of preterm deliveries and LBW in anemic pregnant women in our population. The goal is to inform clinical decision-making and policy planning. Our hospital, being a tertiary care teaching facility,

serves not only the city of Larkana but also its surrounding areas by providing full-spectrum maternity care including prenatal, antenatal, and postnatal services. By focusing on this region and its unique demographic, the research aims to shed light on the burden of anemia-related birth complications and contribute to the development of more effective maternal health strategies.

MATERIALS AND METHODS:

The six months descriptive cross-sectional study was carried out (Nov 14, 2024, to May 13, 2025) in the Department of Obstetrics and Gynaecology at Shaikh Zaid Women Hospital, affiliated with SMBBMU, Larkana. The sample size was calculated using Raosoft software. By considering the reported prevalence of preterm delivery at 26.2% (Ahmad U et al, 2022); a margin of error of 7%, and a 95% confidence interval; the sample of 152 pregnant women with anemia was determined to be adequate for the study and were recruited by a non-probability consecutive sampling method was used to recruit eligible participants. The inclusion criteria were the pregnant women aged 18 to 45 years, whether primigravida or multigravida, with gestational age between 28 and 42 weeks (determined through last menstrual period), and diagnosed with maternal anemia while the exclusion criteria were the women already receiving anticoagulant therapy, those with known chronic renal or hepatic disease, women with a history of thalassemia, sickle cell anemia, or antepartum hemorrhage and the patients diagnosed with autoimmune or connective tissue disorders, hematological malignancies, tuberculosis, or malabsorption syndromes.

The maternal anemia defined as hemoglobin concentration <11 g/dL in the third trimester (laboratory-based).

The preterm delivery considered as birth occurring between 25 and 36 completed weeks of gestation (based on LMP).

The low birth weight (LBW) was defined as birth weight <2.5 kg (measured using a baby weighing scale).

After obtaining approval from CPSP, pregnant women meeting the inclusion criteria and presenting through the emergency or outpatient departments were invited to participate. Written informed consent was obtained before enrollment. All enrolled participants were admitted and evaluated for maternal anemia, preterm delivery, and low birth weight based on the defined criteria. Data collection was conducted using a structured proforma. The principal investigator was responsible for obtaining clinical history, conducting physical examinations, and collecting required information, all under the supervision of a senior obstetrician with a minimum of three years of experience. All expenses related to the study were self-funded by the principal researcher.

Key study variables and potential effect modifiers such as gestational age, hemoglobin levels, parity, booking status, BMI, smoking history, diabetes, hypertension, and other maternal or neonatal outcomes were systematically recorded and monitored throughout the study.

The collected data were entered and analyzed using SPSS. Categorical variables (e.g., preterm delivery, low birth weight, parity) were expressed as frequencies and percentages. Continuous variables (e.g., maternal age, gestational age, hemoglobin level, BMI) were summarized using means and standard deviations for normally distributed data, or medians and interquartile ranges (IQRs) for skewed distributions. The Shapiro-Wilk test was applied to assess data normality. Stratification was carried out based on variables such as age, gestational age, hemoglobin level, parity, booking status, and socioeconomic or educational status to control for confounding factors. Post-stratification, chi-square tests were applied for associations between categorical variables at a 95% confidence interval. Fisher's exact test was used when expected cell frequencies were ≤5 while the significant status for a p-value was ≤0.05.

RESULTS:

Over a six-month period, a total of 152 pregnant women, aged between 18 and 45 years, were enrolled in the study. These women, whether experiencing their first pregnancy or having had previous births, were between 28 and 42 weeks of gestation and were diagnosed with anemia.

The average maternal age was approximately 33.87 years, with a standard deviation of 7.52 years. The mean gestational age was 38.51 weeks (±1.80), while

the mean body mass index (BMI) stood at 29.87 kg/m² (±2.77). Additional demographic and clinical details of the participants are summarized in Table 1. Among the study participants, preterm delivery was observed in 84 women (55.2%), and low birth weight (LBW) was recorded in 68 cases (44.7%). The Shapiro-Wilk test was applied to assess the normality of key variables. The skewness and kurtosis values were as follows:

For BMI: 0.221 (skewness), -0.762 (kurtosis)

For gestational age: 0.237 (skewness), -1.321 (kurtosis)

For maternal age: -0.11 (skewness), -1.181 (kurtosis)

The median values for maternal age, gestational age, and BMI were 36 years, 39 weeks, and 29 kg/m², respectively.

Preterm births and LBW outcomes were further analyzed in relation to several maternal and fetal factors, including age, parity, place of residence (urban vs. rural), antenatal care status (booked vs. unbooked), diabetes mellitus, BMI, hypertension, smoking status, history of stillbirth, NICU admission, early neonatal death, Apgar scores, pre-eclampsia, and educational level. The stratified results are detailed in Table 2.

The statistical analysis revealed that certain variables had a significant association with low birth weight and preterm birth. These includes maternal age ($p = 0.02$), residential area ($p = 0.03$), socioeconomic status ($p < 0.01$), obesity (bmi) ($p = 0.04$), antenatal care status ($p < 0.01$), diabetes mellitus ($p < 0.01$), hypertension ($p = 0.01$), low apgar scores ($p < 0.01$), NICU admissions ($p < 0.01$) and pre-eclampsia ($p < 0.01$). On the other hand, factors such as educational level ($p = 0.49$), smoking ($p = 0.72$), parity ($p = 0.42$), history of stillbirth ($p = 0.61$), and early neonatal death ($p = 0.73$) were found to have no statistically significant association with preterm delivery or low birth weight in this study group.

TABLE 1: BASELINE CHARACTERISTICS OF PARTICIPANTS

PARAMETER	FREQUENCY (n = 152)	PERCENTAGE (%)
AGE (yrs)		
18-19	21	13.8
20-29	45	29.6
30-39	50	32.9
40-45	36	23.7
RESIDENCE		
Urban	79	52.0
Rural	73	48.0
EDUCATIONAL STATUS		
Illiterate	44	28.9
Primary	36	23.7
Middle	34	22.4
Secondary	19	12.5
Higher	19	12.5
ANTENATAL STATUS		
Booked	50	32.9
Un-booked	102	67.1
PARITY		

Primipara	66	43.4
Multiparous	86	56.6
SOCIO-ECONOMIC STATUS		
Low	63	41.4
Middle	50	32.9
Upper	39	25.7
SMOKING		
Yes	56	36.8
No	96	63.2
OBESITY		
Yes	85	55.9
No	67	44.1
NICU ADMISSION		
Yes	50	32.9
No	102	67.1
STILL BIRTH		
Yes	82	56.2
No	64	43.8
HYPERTENSION		
Yes	80	52.6
No	72	47.4
DIABETES MELLITUS		
Yes	98	64.5
No	54	35.5
EARLY NEONATAL DEATH		
Yes	85	55.9
No	67	44.1
LOW APGAR SCORE		
Yes	94	61.8
No	58	38.2
PRE-ECLAMPSIA		
Yes	92	60.5
No	60	39.5
MATERNAL ANEMIA		
Preterm delivery	84	55.2

Low birth weight	68	44.7

TABLE 2: OCCURRENCE OF PRETERM BIRTH AND LOW BIRTH WEIGHT IN PREGNANT ANEMIC WOMEN

	MATERNAL ANEMIA n = 152 (%)			
AGE (years)	Preterm delivery	Low birth weight	Total	P-value
18-19	11	10	21	
	(13.1%)	(14.7%)	(13.8%)	
20-29	19	26	45	
	(22.6%)	(38.2%)	(29.6%)	0.02*
30-39	36	14	50	
	(42.9%)	(20.6%)	(32.9%)	
40-45	18	18	36	
	(21.4%)	(26.5%)	(23.7%)	
RESIDENCE				
Urban	50	29	79	
	(59.5%)	(42.6%)	(52.0%)	
Rural	34	39	73	0.03*
	(40.5%)	(57.4%)	(48.0%)	
EDUCATIONAL STATUS				
Illiterate	29	15	44	
	(34.5%)	(22.1%)	(28.9%)	
Primary	18	18	36	
	(21.4%)	(26.5%)	(23.7%)	
Middle	19	15	34	0.49**
	(22.6%)	(22.1%)	(22.4%)	
Secondary	09	10	19	
	(10.7%)	(14.7%)	(12.5%)	
Higher	09	10	19	
	(10.7%)	(14.7%)	(12.5%)	
SOCIO-ECONOMIC STATUS:				
Low	43	20	63	
	(51.2%)	(29.4%)	(41.4%)	
Middle	27	23	50	<0.01*
	(32.1%)	(33.8%)	(32.9%)	
Upper	14	25	39	
	(16.7%)	(36.8%)	(25.7%)	
SMOKING				
Yes	32	24	56	
	(38.1%)	(35.3%)	(36.8%)	
No	52	44	96	0.72**
	(61.9%)	(64.7%)	(63.2%)	

OBESITY				
Yes	53	32	85	
	(63.1%)	(47.1%)	(55.9%)	
No	31	36	67	0.04*
	(36.9%)	(52.9%)	(44.1%)	
ANTENATAL				
Booked	27	23	50	
	(32.1%)	(33.8%)	(32.9%)	
Un-booked	57	45	102	<0.01*
	(67.9%)	(66.2%)	(67.1%)	
PARITY				
Primipara	38	28	66	
	(45.2%)	(41.2%)	(43.4%)	
Multiparous	46	40	86	0.61**
	(54.8%)	(58.8%)	(56.6%)	
HYPERTENSION				
Yes	52	28	80	
	(61.9%)	(41.2%)	(52.6%)	
No	32	40	72	0.01*
	(38.1%)	(58.8%)	(47.4%)	
DIABETES MELLITUS				
Yes	62	36	98	
	(73.8%)	(52.9%)	(64.5%)	
No	22	32	54	<0.01*
	(26.2%)	(47.1%)	(35.5%)	
NICU ADMISSION				
Yes	57	27	84	
	(67.9%)	(39.7%)	(55.3%)	
No	27	41	68	<0.01*
	(32.1%)	(60.3%)	(44.7%)	
STILL BIRTH				
Yes	30	20	50	
	(35.7%)	(29.4%)	(32.9%)	
No	54	48	102	0.41**
	(64.3%)	(70.6%)	(67.1%)	
EARLY NEONATAL DEATH				
Yes	48	37	85	
	(57.1%)	(54.4%)	(55.9%)	
No	36	31	67	0.73**
	(42.9%)	(45.6%)	(44.1%)	
LOW APGAR SCORE				
Yes	60	34	94	
	(71.4%)	(50.0%)	(61.8%)	
No	24	34	58	<0.01*
	(28.6%)	(50.0%)	(38.2%)	
PRE-ECLAMPSIA				

Yes	60 (71.4%)	32 (47.1%)	92 (60.5%)	<0.01*
No	24 (28.6%)	36 (52.9%)	60 (39.5%)	

*Statistically significant;
**Statistically non-significant

DISCUSSION:

The findings of this study reaffirm the critical link between maternal anemia and adverse pregnancy outcomes, particularly preterm delivery and low birth weight (LBW). These results align with a large body of evidence from both national and international research that demonstrates the harmful impact of anemia during pregnancy on fetal development and gestational outcomes.

In this study, a considerable proportion of anemic women gave birth to preterm or low birth weight infants, highlighting anemia as a significant risk factor. Anemia, especially when moderate to severe, reduces the oxygen-carrying capacity of the mother's blood, which in turn compromises oxygen and nutrient supply to the fetus. This insufficiency may contribute to impaired fetal growth and may trigger early labor, leading to preterm birth. These outcomes can have long-term consequences on neonatal health, increasing the risk of infections, developmental delays, and perinatal mortality (Rahmati S et al, 2017).

Our results also underscore that even mild anemia, if left untreated or poorly managed, can progressively worsen during pregnancy, especially in regions where nutritional deficiencies and limited antenatal care access are prevalent. This indicates the need for timely detection and appropriate intervention strategies to reduce maternal and perinatal complications (Beressa G et al, 2024).

Similar associations have been reported in studies from other developing countries, where anemia is commonly due to iron deficiency, poor dietary intake, frequent pregnancies, and lack of iron supplementation. These socioeconomic and cultural factors, compounded by inadequate health education and access to antenatal services, play a crucial role in the high burden of maternal anemia in such populations (Levy A et al, 2005; Kidanto HL et al, 2009 & Symington EA et al, 2019).

Moreover, it was observed that women with anemia were more likely to experience complications such as fatigue, infections, and delayed wound healing during the postpartum period. These complications not only affect maternal well-being but also increase the likelihood of neonatal complications such as respiratory distress syndrome, feeding difficulties, and the need for NICU admissions among low birth weight and preterm infants.

While our study provides meaningful insights into the association between maternal anemia and poor neonatal outcomes, it is important to acknowledge certain limitations. The study was conducted in a single healthcare facility, which may limit the generalizability of the findings to broader populations. Additionally, factors such as maternal comorbidities, socioeconomic status, and exact causes of anemia were not fully explored, which could have influenced the outcomes.

Despite these limitations, the results emphasize the importance of comprehensive antenatal care, including routine screening for anemia and early initiation of iron and folic acid supplementation. Educating pregnant women about proper nutrition and ensuring timely follow-up during pregnancy can substantially reduce the incidence of anemia-related complications (Yadav P et al, 2023). Looking ahead, it would also be valuable to investigate the impact of correcting anemia at different stages of pregnancy and its effect on birth outcomes.

CONCLUSION:

In this study, preterm births were reported in 84 women (55.2%), while low birth weight infants were noted in 68 cases (44.7%). Statistical analysis revealed that several factors were significantly associated with these outcomes. These included maternal age (p=0.02), place of residence (p=0.03), socioeconomic status (p<0.01), obesity (p=0.04), antenatal care status (p<0.01), presence of diabetes

mellitus (p<0.01), NICU admission (p<0.01), hypertension (p=0.01), low Apgar scores (p<0.01), and pre-eclampsia (p<0.01). These findings highlight that maternal anemia continues to be a major public health challenge, especially in under-resourced areas. However, with timely intervention and improved prenatal care, it is possible to reduce the risks of low birth weight and preterm delivery, ultimately supporting better health outcomes.

LIMITATION OF THE STUDY:

This study had some limitations that should be considered when interpreting the findings. It was conducted at a single healthcare facility and followed a cross-sectional design, which may limit how well the results apply to different or larger populations. To better understand the link between preterm delivery and low birth weight with maternal anemia, future research should involve longer-term, prospective studies with diverse populations across multiple clinical centers. This approach would help strengthen the relevance and generalizability of the results.

AUTHOR'S CONTRIBUTION:

Collection and acquisition of data & grammatical corrections	*Dr. Khushboo*
Concept & design of study & proof read	*Dr. Shaista Tabassum*
Drafting the article and finalizing the manuscript	*Dr. Iqra Ashraf*
Revising critically and make it suitable for final format	*Dr. Rasheeda Parveen*
Acquisition of data and grammatical review	*Dr Sumera Brohi*
Drafting the article and finalizing the manuscript	*Dr. Sidra Ghori*
Final Approval of version	*By All Authors*

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