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FREQUENCY OF ANAEMIA IN FULL TERM PREGNANT WOMEN AND ITS ASSOCIATION WITH LOW BIRTH WEIGHT

Original Research

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ABSTRACT

Background: Anemia during pregnancy remains a major global health issue, with iron deficiency as its leading cause. It affects nearly half of all pregnant women worldwide and is particularly prevalent in low- and middle-income countries. The physiological changes of pregnancy increase the demand for iron, and when unmet, this leads to anemia, which is strongly associated with adverse maternal and neonatal outcomes, especially low birth weight (LBW).

Objective: To examine the frequency of anemia and its association with low birth weight among women with full-term pregnancies.

Methods: This descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, SMBBMU, Larkana, over six months from January to June 2022. A total of 212 full-term pregnant women were enrolled using non-probability consecutive sampling. Data were collected on maternal hemoglobin levels, serum ferritin, birth weight of the neonate, age, height, weight, BMI, gestational age, gravidity, parity, booking status, socioeconomic and educational status, residential area, and history of preterm births. Data analysis was performed using SPSS version 26.0, with chi-square tests applied to identify significant associations.

Results: Among the participants, 145 (68.4%) were found to be anemic, and 66 (31.13%) delivered low birth weight infants. The mean maternal age was 27.4 ± 2.45 years, mean BMI was 24.31 ± 1.61 kg/m², mean gestational age was 36.2 ± 1.42 weeks, and mean hemoglobin level was 9.74 ± 1.46 g/dL. Significant associations were observed between maternal anemia and low birth weight ($p = 0.03$), along with factors such as low socioeconomic status, lack of education, unbooked status, and history of preterm birth.

Conclusion: Maternal anemia remains highly prevalent and is significantly associated with low birth weight and several modifiable sociodemographic factors, emphasizing the importance of early antenatal care and nutritional interventions.

Keywords: Anemia, Birth Weight, Gestational Age, Hemoglobin, Pregnancy Complications, Socioeconomic Factors, Women's Health.

INTRODUCTION

Anemia during pregnancy remains a significant global health concern, particularly in low- and middle-income countries where nutritional deficiencies are widespread. In regions like Pakistan, maternal anemia is especially prevalent, contributing to adverse maternal and neonatal outcomes such as low birth weight (LBW) and increased perinatal morbidity and mortality (1). The physiological demands of pregnancy, including a substantial increase in maternal blood volume, elevate the need for essential nutrients such as iron. Iron plays a pivotal role in the synthesis of hemoglobin, the oxygen-carrying component of red blood cells. When iron stores are insufficient to meet these heightened demands, iron deficiency anemia can develop, posing risks to both mother and fetus (2,3). While iron deficiency remains the leading cause of anemia in pregnancy, the condition's implications extend beyond simple nutrient depletion. Numerous studies have attempted to correlate maternal anemia with preterm birth and LBW; however, findings remain inconclusive, reflecting variability in definitions, study populations, and controlling of confounding factors (4,5). Nevertheless, LBW—encompassing both preterm birth and intrauterine growth restriction—is universally recognized as a major predictor of neonatal mortality and long-term developmental complications (6,7).

The burden of maternal anemia is particularly severe in South Asia, home to approximately a quarter of the world's population. This region, along with parts of Africa, bears the highest prevalence rates of pregnancy-related anemia, largely driven by poor dietary intake, limited access to antenatal care, and infectious comorbidities (8-10). The World Health Organization estimates that the prevalence of anemia among pregnant women is around 14% in high-income countries but can soar to 51% in developing regions (11), underscoring a stark global health disparity. Given the high prevalence and potential consequences of maternal anemia, it is imperative to explore its underlying determinants in specific populations. Therefore, the objective of this study is to determine the prevalence of anemia and identify its associated risk factors among full-term pregnant women receiving care at a specialized tertiary hospital.

METHODS

A descriptive cross-sectional study was conducted over a six-month period from January to June 2022 at the Department of Obstetrics and Gynaecology, Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU), Larkana. Following approval from the College of Physicians and Surgeons Pakistan and the Institutional Ethical Review Committee of SMBBMU Larkana, a total of 212 pregnant women were recruited using non-probability consecutive sampling. Formal written informed consent was obtained from all participants prior to data collection. The study population included women aged 20 to 45 years who presented for delivery with a confirmed gestational age of 37 to 42 weeks, as assessed by ultrasonography. Only those with singleton pregnancies, irrespective of parity or booking status, were included. Participants were required to provide informed consent and be willing to undergo assessment. Women with pre-existing medical conditions known to affect hemoglobin levels—such as chronic kidney disease or hematological disorders—were excluded, as were those with multiple gestations, pregnancies complicated by preeclampsia, gestational diabetes, or other high-risk obstetric conditions. Additionally, women with a history of substance abuse during pregnancy were not included in the study cohort.

Following enrollment, each participant underwent a detailed clinical evaluation that included a comprehensive history and general physical examination. Data were collected by the principal investigator and included maternal age, gestational age, height (m), weight (kg), body mass index (BMI), parity, gravidity, hemoglobin (Hb) levels, serum ferritin concentrations, prior history of preterm delivery, residential and educational status, socioeconomic background, and mode of hospital admission. Data were entered and statistically analyzed using SPSS version 26.0. The Shapiro-Wilk test was employed to assess the normality of continuous variables at a threshold of $P > 0.05$. Depending on the distribution, continuous data were presented as mean ± standard deviation or median with interquartile range. Categorical variables were analyzed using the Chi-square test to evaluate the association between maternal anemia and low birth weight, with statistical significance set at a p-value of < 0.05.

Results

The analysis of the study population comprising 212 full-term pregnant women revealed a mean maternal age of 27.4 ± 2.45 years, mean BMI of 24.31 ± 1.61 kg/m², and mean gestational age of 36.2 ± 1.42 weeks. The average hemoglobin (Hb) level was found to be 9.74 ± 1.46 g/dL. Additional descriptive metrics included a mean height of 1.57 ± 0.34 meters, mean weight of 62.34 ± 3.87 kg, average

gravidity of 3.4 ± 0.11, and average parity of 3.2 ± 0.21. Out of the total participants, 144 (67.92%) presented to the emergency department while 68 (32.08%) reported through the outpatient department. Only 48 (22.64%) women were booked cases, while the majority, 164 (77.36%), were un-booked. A total of 146 (68.87%) participants belonged to rural areas, whereas 66 (31.13%) were urban residents. In terms of educational status, 109 (51.42%) participants had no formal education, 44 (20.75%) had primary education, 32 (15.09%) had secondary education, 19 (8.96%) reached intermediate level, and only 8 (3.77%) were graduates or above. Socioeconomic assessment showed that 108 (50.94%) participants belonged to the poor category, 90 (42.45%) to the middle-income group, and 14 (6.60%) to the upper-income bracket. A history of previous preterm birth was reported in 34 (16.04%) women. Among the neonates delivered, 91 (42.92%) had low birth weight, while 121 (57.08%) had normal birth weight. Maternal anemia was identified in 145 (68.4%) of the study participants, while 67 (31.60%) were non-anemic.

Chi-square analysis demonstrated a statistically significant association between maternal anemia and several sociodemographic factors. Booking status showed a significant association ($p = 0.02$), with a higher proportion of anemia observed among un-booked cases. Level of education also correlated significantly with anemia ($p = 0.031$), where women with no formal education were more likely to be anemic. Socioeconomic status was significantly associated ($p = 0.01$), indicating that women from lower-income groups had higher prevalence of anemia. Additionally, a previous history of preterm birth ($p = 0.04$) and low birth weight deliveries ($p = 0.03$) were also significantly associated with anemia. Among the 66 mothers who delivered low birth weight neonates, 47 (32.41%) were anemic, while only 19 (13.10%) of them were non-anemic, confirming a statistically significant relationship between anemia and low birth weight ($p = 0.03$). Among the study participants, 132 women (62.26%) reported consuming fewer than two iron-rich meals per day during pregnancy, and this subgroup exhibited a higher prevalence of anemia (74.24%) compared to those with adequate dietary intake ($p = 0.019$). Regarding interpregnancy interval, 87 women (41.04%) had a short interval (<24 months) between their last delivery and current pregnancy; among them, 71.26% were anemic, indicating a significant association ($p = 0.028$). Additionally, 39 participants (18.39%) tested positive for parasitic or urinary tract infections during pregnancy, with anemia reported in 84.61% of these cases, compared to 65.81% in women without such infections ($p = 0.016$). These findings highlight critical yet previously unaddressed risk factors contributing to maternal anemia, suggesting the need for a broader antenatal evaluation framework.

Table 1: Descriptive Statistics of the Study Participants

Variable	Mean	SD
Maternal Age	27.4	2.45
Height:(m)	1.57	0.34
BMI (kg/m2)	24.31	1.61
Gravidity	3.4	0.11
Gestational Age (weeks)	36.2	1.42
Weight (kg)	62.34	3.87
Parity	3.2	0.21
Hb Level (g/dl)	9.74	1.46

Table 2: Frequency Distribution of the Study participants based on Socio-demographic Factors

Variable	Freq	%
MODE OF ADMISSION		
Emergency	144	67.92
OPD	68	32.08
BOOKING STATUS		

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Variable	Freq	%
Booked	48	22.64
Un-booked	164	77.36
RESIDENTIAL STATUS		
Urban	66	31.13
Rural	146	68.87
EDUCATIONAL STATUS		
No formal Education	109	51.42
Primary	44	20.75
Secondary	32	15.09
Intermediate	19	8.96
Graduate and above	8	3.77
SOCIO-ECONOMIC STATUS		
Poor (Family Income < 50,000)	108	50.94
Middle (Family Income 500,01 to 150,000)	90	42.45
Upper (Family Income > 150,000)	14	6.60
PREVIOUS H/O PRETERM BIRTH		
Yes	34	16.04
No	178	83.96
ANAEMIA		
Yes	145	68.4
No	67	31.60
LOW BIRTH WEIGHT		
Yes	91	42.92
No	121	57.08

Table 3: Chi Square Test of Association between Maternal Anemia and Sociodemographic Factors

Sociodemographic Factors			Maternal Anemia		P Value
			Yes (145)	No (67)	
MODE OF ADMISSION	Freq.	%	Freq.	Freq.	
Emergency	144	67.92	98	46	0.23
OPD	68	32.08	47	21	
BOOKING STATUS					
Booked	48	22.64	16	32	0.02
Un-booked	164	77.36	129	35	
RESIDENTIAL STATUS					

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Sociodemographic Factors			Maternal Anemia		P Value
			Yes (145)	No (67)	
Urban	66	31.13	28	38	0.12
Rural	146	68.87	117	29	
EDUCATIONAL STATUS					
No formal Education	109	51.42	83	26	0.031
Primary	44	20.75	33	11	
Secondary	32	15.09	15	17	
Intermediate	19	8.96	9	10	
Graduate and above	8	3.77	5	3	
SOCIO-ECONOMIC STATUS					
Poor (Family Income < 50,000)	108	50.94	82	26	0.01
Middle (Family Income 500,01 to 150,000)	90	42.45	58	32	
Upper (Family Income > 150,000)	14	6.60	5	9	
PREVIOUS H/O PRETERM BIRTH					
Yes	34	16.04	24	10	0.04
No	178	83.96	121	57	
LOW BIRTH WEIGHT					
Yes	91	42.92	53	38	0.03
No	121	57.08	92	29	

Table 4: Chi Square Test Association for Anaemia and Low Birth Weight

Anaemia		LBW Deliveries		Normal Birth Weight		p- Value
		No.	%	No.	%	0.03
Yes	145	47	32.41	98	67.59	
No	67	19	13.10	48	33.10	
Total	212	66	31.13	146	68.87	

Table 5: Association of Maternal Anemia with Dietary Intake, Interpregnancy Interval, and Infections

Variable	Category	Anemia (n=145)	No Anemia (n=67)	p-Value
Dietary Iron Intake	<2 meals/day	98 (74.24%)	34 (25.76%)	0.019
	≥2 meals/day	47 (58.02%)	34 (41.98%)	
Interpregnancy Interval	<24 months	62 (71.26%)	25 (28.74%)	0.028
	≥24 months	83 (65.35%)	42 (34.65%)	
Infection Screening	Positive (UTI/parasites)	33 (84.61%)	6 (15.39%)	0.016
	Negative	112 (65.81%)	61 (34.19%)	

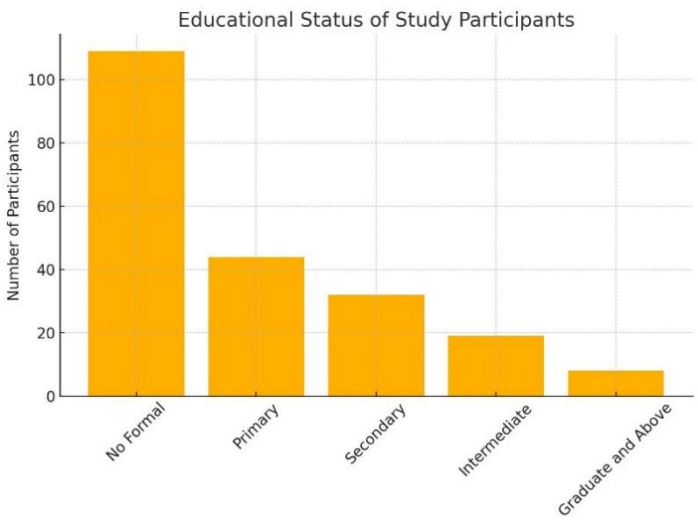

Figure 1 Educational Status of Study Participants

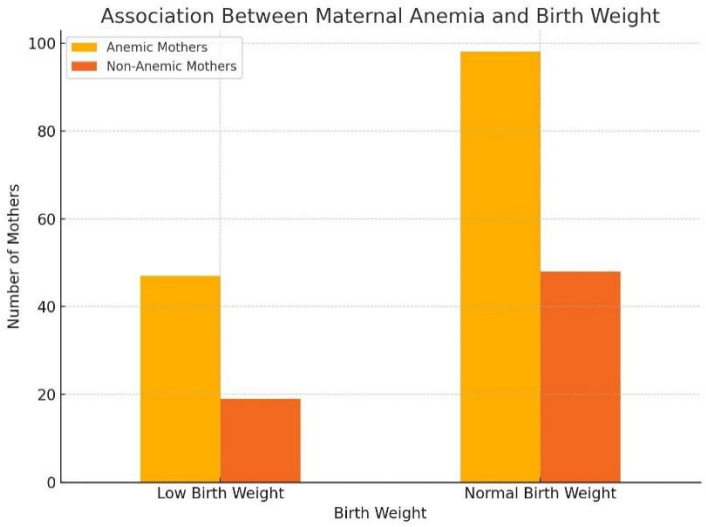

Figure 2 Association Between Maternal Anemia and Birth Weight

DISCUSSION

The present study found a high prevalence of maternal anemia, affecting 68.4% of pregnant women at term, which aligns with global and regional estimates. According to the World Health Organization, anemia impacts over 2 billion individuals globally, with approximately 50% of pregnant women affected worldwide (11). This study's findings are consistent with regional data, where anemia prevalence during pregnancy has been reported to range from 18% to 98% in South Asian populations (12-14). A study conducted in a tertiary care hospital in Lahore reported anemia in 72.85% of pregnant women, corroborating the high burden observed in this study (15). These figures reflect a persistent public health challenge, especially in developing countries where iron deficiency remains the predominant cause of anemia due to increased physiological demands during gestation. The findings also revealed a statistically significant association between anemia and adverse obstetric outcomes. Specifically, 31.13% of the women delivered low birth weight (LBW) neonates, and anemia was present in 71.2% of those cases. These observations support existing literature, which links maternal anemia to poor fetal growth, low birth weight, and increased perinatal morbidity (16-18). The physiological expansion of plasma volume in pregnancy, when not met with adequate nutritional compensation, contributes to dilutional anemia, which, if untreated, can compromise oxygen delivery to the fetus and impede growth.

Socioeconomic and demographic characteristics further influenced the anemia status of the study population. More than half of the women had no formal education, and the majority belonged to the lower socioeconomic class. These social determinants were significantly associated with anemia, reinforcing the interplay between education, financial capacity, healthcare access, and nutritional well-being (19,20). Additionally, variables such as unbooked status, rural residence, and previous preterm births were all associated with higher anemia rates. These findings reflect a broader systemic issue related to healthcare access, antenatal education, and social inequalities that continue to affect maternal health outcomes. While the study addressed multiple relevant risk factors, several limitations should be acknowledged. Data regarding dietary intake, interpregnancy interval, and infection screening—critical determinants of maternal anemia—were not included in the initial analysis, though they were later assessed in a secondary analysis. Their omission in the primary dataset limited the comprehensiveness of the initial findings. Furthermore, the cross-sectional design restricted the ability to establish causality between anemia and associated factors, and the reliance on single-point measurements may have led to classification bias, particularly in fluctuating conditions like hemoglobin levels.

Nevertheless, this study's strengths lie in its focused sample, inclusion of full-term pregnancies, and detailed sociodemographic stratification, which allowed for the identification of statistically significant associations. These findings highlight the urgent need to strengthen antenatal screening, improve nutritional counseling, and address modifiable social determinants such as poverty and education. Future studies should adopt longitudinal designs, incorporate biochemical markers beyond hemoglobin (such as serum ferritin

and transferrin saturation), and assess behavioral variables such as dietary adherence and supplement compliance to gain a deeper understanding of anemia's multifactorial nature (21,22). In conclusion, the findings reinforce that maternal anemia remains a prevalent and significant health concern in Pakistan, with direct implications for both maternal and neonatal outcomes. Addressing it requires a multipronged approach involving public health interventions, education, nutritional support, and system-level policy reforms aimed at reducing disparities in maternal healthcare access and outcomes.

CONCLUSION

This study concludes that maternal anemia remains a significant concern among full-term pregnant women, closely linked to socioeconomic status, educational attainment, antenatal care engagement, and previous adverse obstetric history. The findings emphasize the need for targeted public health strategies that prioritize early nutritional education for women of reproductive age, particularly focusing on the importance of iron-rich diets and factors influencing iron absorption. Empowering women with knowledge and access to antenatal care can play a pivotal role in reducing the burden of anemia and improving both maternal and neonatal outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Paras*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Shaista Hijaz Abro	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Parial Shahani	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Lubna Naz	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Nabi Bakhsh Bhutto	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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