

## FREQUENCY OF LOW BIRTH WEIGHT IN BABIES BORN TO ANEMIC PREGNANT WOMEN AT TERM GESTATION; A CROSS-SECTIONAL STUDY

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## INTRODUCTION

Low birth weight and maternal anemia are major public health challenges, especially in low-resource countries. Persistent low infant weight contributes to increased mortality and morbidity, impacting individual well-being and creating broader social and economic concerns.<sup>1</sup> According to the World Health Organization, newborns weighing less than 2500 grams are classified as having low birth weight.<sup>2</sup> This condition varies from 15 to 20% worldwide, encompassing over 20 million births annually. A significant majority, around 90%, of these cases are concentrated in countries with low to middle income.<sup>3</sup> Pakistan demographics and health survey in 2006-07 and 2012-13 reported 31.5% - 19.5% of births as underweight, with higher percentages in Balochistan (24.1%) and Gilgit Baltistan (25.3%). Punjab had 18.5%, Sindh 19.3%, and KPK 21%. Urban women had a lower rate of low birth weight (14.5%) than rural women (21.4%).<sup>4,5</sup> Infants born with a weight under 2500 grams are at a higher risk of experiencing both

infant mortality and health issues. These challenges include feeding problems, failure to thrive, susceptibility to infections due to compromised immunity, hypoglycemia, hypothermia, fluid & electrolyte imbalance, and underdeveloped lungs & liver. Early in life, they experience lower intelligence and stunted growth, while later in life, they face diabetes, obesity, and other metabolic disorders. The mortality rate for low birth weight continues to increase, accounting for 60-80% of neonatal deaths each year.<sup>3,6,7</sup> Anemia is a global issue that affects both developed and underdeveloped countries. Anemia is characterized by low hemoglobin levels, causing impaired oxygen delivery to tissues.<sup>8</sup> In females of reproductive age, factors that may contribute to causing anemia include dietary deficiencies, poor socioeconomic status, multiparity, and other medical conditions.<sup>9</sup> The World Health Organization defines anemia in pregnant women using the following hemoglobin cutoffs: mild (100 to less than 110 g/L), moderate (70 to less than 100 g/L), and severe (less than 70 g/L).<sup>10</sup> The World Health Organization reports

### ABSTRACT

#### OBJECTIVES

To assess the potential impact of maternal health on the frequency of low birth weight in newborns of anemic pregnant women at term gestation.

#### METHODOLOGY

It is a cross-sectional (Descriptive) study in the Department of Obstetrics & Gynecology, from 1st August 2022 to 31st July 2023. We recruited 169 pregnant ladies of any gravidity, 18-45 years of age at term gestation ( $37 \pm 0$  weeks to  $41 \pm 6$  weeks), who presented with anemia and were included in this study. Patients who refused to participate in the study or had any other medical disorder leading to low birth weight, i.e., pregnancy-induced hypertension, chronic kidney disease, antiphospholipid syndrome, autoimmune conditions, and uteroplacental insufficiency, were excluded from the study.

#### RESULTS

One hundred sixty-nine patients were enrolled in this study; 45 patients were between 18 and 27 years of age, 80 were between 28 and 37 years, and 44 were recorded at 37-45. Mean and Standard Deviations for age was 32 Years  $\pm 6.68$ , for gestational Age 38 Weeks  $\pm 1.23$ , for Parity  $3 \pm 1.31$ , for Hemoglobin Level it was 10.7 g/L  $\pm 14.95$ , and for Birth Weight, it was recorded as 2500 grams  $\pm 279.24$ . The frequency of low birth weight was recorded in 36 (21.30%) newborns of anemic pregnant women at term gestation.

#### CONCLUSION

The prevalence of low birth weight in newborns of anemic pregnant women at term was found to be high. A comprehensive approach regarding health education and anemia management in pregnant women is required.

**KEYWORDS:** Iron Deficiency Anemia, Term gestation, Low Birth Weight

that >1.6 billion people are affected by anemia globally, including 38.2% of the pregnant population. Despite its worldwide prevalence, anemia is more common in developing countries, with the largest proportion in Southeast Asia at 48.7%.<sup>11-12</sup> Iron demand increases 6 to 7 times in late pregnancy. Anemia during pregnancy is common among women in developing nations, suggesting that preexisting iron stores are frequently insufficient and that physiologic changes induced by pregnancy are insufficient to fulfill the increasing requirements surveyed.<sup>13,14</sup> In Pakistan, the prevalence of anemia affects 41.7% to 77% of women in their reproductive years, particularly in rural areas, which is associated with adverse health outcomes.<sup>15</sup> In this study, we intended to determine the frequency of low birth weight in newborns among pregnant women with anemia in the third trimester. The implications of these findings will emphasize the need for a comprehensive healthcare approach and education for anemic pregnant women. Ultimately the purpose of this study is to bridge the gap in women and child health care.

## METHODOLOGY

The cross-sectional descriptive study was conducted in the Gynecology and Obstetric Department of Hayatbad Medical Complex Peshawar from 1st August 2022 till 31st July 2023. The sample size was 169, taking 12.5% proportion of term (37+0 to 41+6 weeks) pregnant women with anemia giving birth to low birth weight infants, 95% confidence interval and 5% margin of error, using WHO software for sample size calculation.<sup>16</sup> Non probability consecutive technique was used for data collection. Approval from the hospital's ethical and research committee was taken (Ref:1085). The women at term gestation from 37+0 to 41+6, both primigravida and multigravida with Hemoglobin below 11 gm/dl, Decreased MCV, MCH, MCHC, and serum ferritin <30ug/dl who were admitted to the ward and labor suite were included in this study. Patients who refused to participate in the study or had medical disorders leading to low birth weight, i.e., pregnancy-induced hypertension, chronic kidney disease, antiphospholipid syndrome, autoimmune conditions, and uteroplacental insufficiency, were excluded from the study. All patients were worked up with detailed history and clinical examination. The purpose and benefits of the study were explained to all patients, and they were assured that the study was done purely for research and data publication. A written informed consent was also obtained for enrollment. The patient's hemoglobin level was checked from the

hospital's main laboratory using the absorbance / automatic hematology analyzer 12 parameter method, while the newborn's weight using the labor room weight machine was checked immediately after birth. Data was analyzed using SPSS version 22. Mean + standard deviation was calculated for continuous variables like age, gestational age, Parity, hemoglobin level, and birth weight of patients. Frequency and percentages were calculated for qualitative variables like low birth weight. Low birth weight was stratified among age, gestational age, birth weight, hemoglobin level, and Parity to see effect modifications. A post-stratification chi-square test was applied to see the effect modification. P value  $\leq 0.05$  was considered significant. All results were presented in the form of tables/charts.

## RESULTS

There were 45 patients in the 18-27 age group, 80 patients in 28-37 years and 44 patients in 37-45 years. Mean and SDs for age were 32 Years  $\pm$  6.68, for gestational Age 38 Weeks  $\pm$  1.23, for Parity, 3+1.31. For Hemoglobin Level, it was 10.7 g/L+14.95, and for Birth Weight, it was recorded as 2500 grams  $\pm$  279.24. Frequencies and Percentages for Low Birth Weight were recorded in 36 (21.30%) patients (Table No. 1). Stratification of Low Birth Weight for Age, Gestational Age, Parity, and Hemoglobin Level were recorded in Table No. 2,3,4,5, respectively.

**Table 1: Frequencies & Percentages for Low Birth Weight (n=169)**

Low Birth Weight	Frequency	%age
Yes	36	21.30
No	133	78.69

**Table 2: Stratification of Low Birth Weight with Respect to Age (n=169)**

Age	Low Birth Weight	Frequency	%age	P-Value
18-27 Years	Yes	05	2.95	0.00003
	No	40	23.66	
28-37 Years	Yes	11	6.50	
	No	69	40.82	
38-45 Years	Yes	20	11.83	
	No	24	14.32	

**Table 3: Stratification of Low Birth Weight with Respect to Gestational Age (n=169)**

Gestational Age	Low Birth Weight	Frequency	%age	P-Value
= 37 Weeks	Yes	12	07.10	0.352
	No	34	20.11	
$\leq$ 41+6 Weeks	Yes	24	14.20	
	No	99	58.57	

**Table 4: Stratification of Low Birth Weight with Parity (n=169)**

Parity	Low Birth Weight	Frequency	%age	P-Value
Primigravida	Yes	01	0.59	0.0210
	No	04	2.36	
Multigravida (2-5kids)	Yes	04	2.36	
	No	48	28.40	
Grand Multigravida (6-10kids)	Yes	14	8.28	
	No	50	29.58	
Great Grand Multigravida(>10 kids)	Yes	17	10.06	
	No	31	18.34	

**Table 5: Stratification of Low Birth Weight with Respect to Hemoglobin Level (n=169)**

Hemoglobin Level	Low Birth Weight	Frequency	%age	P-Value
≤ 80 mg/L	Yes	30	17.75	0.0001
	No	97	57.39	
> 80 mg/L	Yes	06	3.55	
	No	36	21.30	

## DISCUSSION

Low birth weight is an indicator of fetomaternal health care, as low birth weight is associated with poor maternal health secondary to malnutrition, illness, hypertension, anemia, etc. Among various causes of low birth weight, anemia occurs in each trimester of pregnancy. The main findings of our study showed that maternal anemia is a serious risk factor for low birth weight. Maternal nutritional status is a significant determinant of birth weight. The prevalence of anemia during pregnancy in various studies was reported as 41.7%-77%, 25.2%, 27%, 72% and 78.45%.<sup>15-17-18-19-20</sup> This variation might result from selection criteria, socioeconomic status, dietary habits, antenatal micronutrient supplementation, etc. All of these factors influence the occurrence of anemia during pregnancy. In our study, anemic mothers delivered 21.3% of newborns with low birth weight. The prevalence of low birth weight was 15.6%, 20.3%, and 34.1% in different studies.<sup>21-22-23</sup> A study conducted by Melaku et al. reported that the prevalence of anemia among delivered women was 16.1, 1% where, as the proportion of low birth weight in that study was found to be 12.32%.<sup>24</sup> The results of our study were also consistent with the studies mentioned above showing that the majority of anemic mothers gave birth to low birth weight babies with a very high significant difference (p=0.0001). In contrast to our study, Syafiqoh G. et al. reported no relationship between anemia in pregnancy and LBW infants.<sup>25</sup> In another study by Javed H, LBW was found to be 13.35% while our study showed 21.3%. A study conducted in Sindh<sup>26-16</sup> reported Low Birth Weight in 12.5% of newborns of anemic mothers, which is

comparable to our study where Frequencies and Percentages for Low Birth Weight were recorded in 36 (21.30%) newborns of anemic pregnant women at term. In our study, more low birth weight (20.07%) were encountered in the high parity group. Another study conducted by Garces A. et al. found that nulliparity was independently associated with lower birth weight and higher neonatal mortality compared to multiparity.<sup>27</sup> Our study found that the birth weights of the most low (18.3%) were in the advanced age group. Similarly, the study by Goisis A. et al. showed that most mothers (37%) fell in the 25-29 age group. There's a U-shaped correlation between maternal age and low birth weight. Mothers aged 40 years or older had the highest prevalence of LBW. In contrast to our results, Chung YH et al. demonstrated that a parental age of ≥ 35 years was associated with both term LBW and macrosomia.<sup>29</sup> In our study, post-dated pregnancy was more (14.2%) associated with low birth weight. According to the study by Karmakar S et al., the incidence of low birth weight was significantly lower in post-dated pregnancy, which is discordant with our results.<sup>30</sup> Our results showed that maternal anemia and nutritional status markedly affected overall Neonatal birth weight. The result indicates that prevention and control of anemia alone will play a significant role in preventing the occurrence of low birth weight among neonates. Based on our findings, we advocate that greater attention be placed on the impact of maternal and child health programs on anemia-related outcomes in low-income countries. This study will help us stress the importance of anemia management in pregnancy and thus decrease the incidence of low birth weight infants. Routine antenatal care with a consistent recommendation of Iron and Folic acid supplements combined with tailored nutritional support and dietary counseling according to the mother's educational background and surrounding circumstances can effectively decrease the low birth weight rate and its consequences.

## LIMITATIONS

This cross-sectional study only captures the data a single time and cannot follow the changes over time. Self-selection bias contributes to the limitations because women who agreed to participate might differ from those who declined in ways that could affect the result. We recruited the women presenting to the hospital not fully representing the diversity of anemia during pregnancy (recall and sampling bias). Moreover, conducting a study in a single institution might not encompass the variations in healthcare practices or patient demographics seen in broader geographic areas, limiting the generalizability of study results.

## CONCLUSIONS

This cross-sectional analysis revealed a significant association between maternal anemia and low birth weight infants. Future longitudinal or experimental studies are warranted to explore the causal relationship and better understand the dynamics between maternal anemia and its potential impact on birth weight outcomes.

**CONFLICT OF INTEREST:** None

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