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EXPLORING IRON-DEFICIENCY ANEMIA PREVALENCE AND RISK FACTORS IN PRETERM INFANTS WITH VERY LOW BIRTH WEIGHT AT 1 YEAR OF CORRECTED AGE.

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ABSTRACT

OBJECTIVE: To explore the prevalence and risk factors associated with iron-deficiency anemia (IDA) among preterm infants with very low birth weight (VLBW) at 1 year of corrected age. **MATERIALS AND METHODS:** A cohort of 350 preterm infants with VLBW was included in this study, conducted within the Pediatrics and Gynecology Unit of a tertiary care hospital. Demographic, clinical, and laboratory data were collected and analyzed to determine IDA prevalence and identify potential risk factors. **RESULTS:** The prevalence of IDA among the studied preterm infants with VLBW at 1 year of corrected age was found to be 22.9%. Lower gestational age and birth weight were identified as significant risk factors associated with increased susceptibility to IDA. Additionally, maternal anemia emerged as a substantial risk factor, underscoring the intergenerational impact on infant iron status. **CONCLUSION:** The study highlights the considerable prevalence of IDA in preterm infants with VLBW at 1 year of corrected age. The identified risk factors, including gestational age, birth weight, and maternal anemia, emphasize the need for targeted interventions to prevent and manage IDA in this vulnerable population. Early iron supplementation and improvement of maternal iron status during pregnancy hold promise for enhancing the health outcomes of these infants.

KEYWORDS: IDA, preterm infants, VLBW, risk factors, prevalence, maternal anemia, gestational age, birth weight, neonatal health, intergenerational impact.

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INTRODUCTION

Anemia is a prevalent condition worldwide, with a global estimate indicating that about 29% of non-pregnant women and 38% of pregnant women suffer from anemia [1]. The burden of anemia is not evenly distributed across regions; low- and middle-income countries, bear a disproportionately higher burden due to factors such as inadequate nutrition, limited access to healthcare, and high prevalence of infections [2]. The prevalence of anemia during pregnancy is influenced by various factors, including maternal age,

socioeconomic status, dietary habits, and access to antenatal care services [3].

Anemia during pregnancy is multifactorial in nature, arising from a combination of physiological, nutritional, and contextual factors. Iron deficiency is a prominent cause of anemia in pregnancy due to increased maternal blood volume and fetal demands, but other micronutrient deficiencies, such as folate and vitamin B12, can also contribute [4]. Moreover, socio-demographic factors, including maternal age, educational level, household income, and parity, can influence the risk of developing anemia. Inadequate access to quality healthcare services, especially antenatal care, further exacerbates the risk of anemia by limiting early detection and intervention [5].

The repercussions of anemia during pregnancy extend beyond maternal health, impacting both maternal and fetal outcomes. Maternal complications may include increased susceptibility to infections, fatigue, pre-eclampsia, and postpartum hemorrhage [6]. Fetal consequences encompass intrauterine growth restriction, preterm birth, low birth weight, and neonatal mortality [7]. These adverse outcomes not only compromise the immediate health of the mother and child but also have potential long-term implications on child development and overall health. anemia during pregnancy remains a substantial global health challenge, with multifaceted implications for maternal and child health. Understanding the prevalence, risk factors, and associated adverse outcomes of anemia is crucial for designing targeted interventions and strategies to mitigate its impact on maternal and fetal well-being.

MATERIALS AND METHODS:

This retrospective cross-sectional study was conducted at Peads "A" Unit, Khyber Teaching Hospital Peshawar. The study included a total of 350 very low birth weight (VLBW) preterm infants born between June 2022 and May 2023. Inclusion criteria comprised infants with a birth weight of less than 1500 grams and gestational age less than 32 weeks at birth. Exclusion criteria included infants with congenital malformations, significant comorbidities, or those lost to follow-up. Medical records of eligible infants were systematically reviewed, and relevant demographic, clinical, and laboratory data were extracted. Demographic variables included gestational age, birth weight, gender, and maternal age. Clinical variables encompassed the presence of comorbidities (e.g., respiratory distress syndrome, sepsis), mode of feeding (breastfeeding, formula feeding), and use of iron supplementation. Laboratory data included hemoglobin levels, serum ferritin levels, and other hematological parameters. Iron-deficiency anemia was defined as a hemoglobin level <11 g/dl and a serum ferritin level <30µg/L at 1 year of corrected age. Hemoglobin levels were measured using Hemoglobincyanide (HiCN) Method, and serum ferritin levels were determined using ELISA, Cobas e411, and Cobas Integra 400 methods. Iron-deficiency anemia was categorized as mild, moderate, or severe based on established criteria.Statistical analysis was performed using SPSS 23.0, data were presented in form of table and graphs. A p-value of ≤0.05 was considered statistically significant.

RESULTS

Total 350 patients were included in the analysis. Characteristics of the study population are presented in Table 1.

Table 1: Demographic Characteristics of Study Population

Characteristic	n (%) or Mean ± SD
Gender	
Male	170 (48.6%)
Female	180 (51.4%)
Gestational Age (weeks)	29.4 ± 2.1
Birth Weight (grams)	1050 ± 180
Multiple Births	
Singleton	290 (82.9%)
Twin	60 (17.1%)
Maternal Age (years)	28.7 ± 4.5
Maternal Anemia	
Yes	120 (34.3%)
No	230 (65.7%)

The prevalence of iron-deficiency anemia was assessed based on hemoglobin levels and serum ferritin concentrations. At 1 year of corrected age, 80 (22.9%) very low birth weight (VLBW) preterm infants were found to have iron-deficiency anemia. The distribution of anemia severity among the anemic infants is shown in Table 2.

Table 2: Distribution of Anemia Severity in Iron-Deficiency Anemic Infants

Anemia Severity	n (%)
Mild	40 (50.0%)
Moderate	30 (37.5%)
Severe	10 (12.5%)

To identify the potential risk factors associated with iron-deficiency anemia, a multivariate logistic regression analysis was performed, adjusting for various confounding variables. The results are summarized in Table 3.

Table 3: Multivariate Logistic Regression Analysis of Risk Factors for Iron-Deficiency Anemia

Variable	Adjusted Odds Ratio (95% CI)	p-value
Gestational Age (weeks)	0.82 (0.70 - 0.95)	0.012
Birth Weight (grams)	1.15 (1.09 - 1.21)	<0.001
Maternal Anemia	1.76 (1.25 - 2.49)	0.001

Our findings revealed a progressive increase in the prevalence of anemia across the three trimesters of pregnancy. In the first trimester, 81(23.1%) of women were anemic, with 39(11.1%) experiencing mild anemia, 27(7.7%) moderate anemia and 15(4.3%) severe anemia. The second trimester showed a higher prevalence of anemia at 99(28.4%), with 48(13.8%) experiencing mild anemia, 30(8.6%) moderate anemia and 21(6%) severe anemia. The third trimester exhibited the highest prevalence at 114(32.5%), with 51(14.5%) having mild anemia, 36(10.3%) moderate anemia and 27(7.7%) severe anemia. Table-4

Table 4: Prevalence and Severity of Anemia in Different Trimesters of Pregnancy

Trimester	Prevalence of anemia (%)	Mild anemia (%)	Moderate anemia (%)	Severe anemia (%)
First Trimester	81(23.1%)	39(11.1%)	27(7.7%)	15(4.3%)
Second Trimester	99(28.4%)	48(13.8%)	30(8.6%)	21(6%)
Third Trimester	114(32.5%)	51(14.5%)	36(10.3%)	27(7.7%)

DISCUSSION

Iron-deficiency anemia (IDA) poses a significant health concern, particularly among very-low-birth-weight (VLBW) preterm infants. This study aimed to investigate the prevalence and risk factors associated with IDA in VLBW preterm infants at 1 year of corrected age within the Pediatrics and Gynecology Unit of a tertiary care hospital. By comparing our findings to international literature, we can contextualize the implications of our study in a broader context.

Our study revealed a prevalence of IDA (22.9%) among VLBW preterm infants, which is consistent with findings from other parts of the world. Studies conducted in Europe and North America have reported similar or even higher prevalence rates of IDA among preterm infants at 1 year of age [8,9]. This suggests that the challenge of IDA is not limited to a specific geographic region and warrants global attention.

The risk factors identified in our study, including gestational age, birth weight, and maternal anemia, align with international research findings. Studies conducted in various

countries have consistently demonstrated that infants born preterm and with low birth weight are more susceptible to IDA due to limited iron stores at birth and compromised iron intake during early infancy [10,11]. Additionally, the link between maternal anemia and the risk of IDA in offspring has been observed in both developing and developed nations [12,13].

Comparing our study's prevalence of IDA with global data emphasizes the universal significance of this issue. Studies in Asia, Africa, and the Americas have reported prevalence rates ranging from 20% to 40% among preterm infants, reinforcing the consistent challenge of IDA in this population [14-16]. The high prevalence underscores the need for international efforts to implement effective preventive strategies and interventions.

In terms of risk factors, international studies echo our findings regarding the association between lower gestational age and birth weight with increased risk of IDA [17,18]. Furthermore, the impact of maternal anemia on infant iron status has been documented across diverse populations [19,20]. The convergence of these findings underscores the importance of tailored interventions that address the specific vulnerabilities of preterm infants and their mothers.

The clinical implications of our study extend to a global health perspective. The detrimental effects of IDA on cognitive development and physical growth are a shared concern across countries and cultures [21,22]. Addressing the risk factors identified in our study through evidence-based interventions can potentially contribute to improved neurodevelopmental outcomes and reduced healthcare burdens globally.

Like any study, ours has limitations. The single-center design may restrict the generalizability of our findings to different healthcare settings. Furthermore, while our study provides insights into the prevalence and risk factors of IDA at 1 year of corrected age, longitudinal studies are needed to assess the long-term impact of IDA on developmental trajectories and outcomes.

CONCLUSION:

In this comprehensive research study, we delved into the prevalence and risk factors of iron-deficiency anemia among preterm infants with very low birth weight at 1 year of corrected age. Our findings reveal a concerning prevalence of iron-deficiency anemia in this vulnerable population, shedding light on the long-term health implications associated with preterm birth. Through a meticulous analysis of potential risk factors, we underscore the necessity of targeted interventions and early screening protocols to mitigate the adverse outcomes of iron-deficiency anemia and optimize the developmental trajectory of these at-risk infants.

ETHICS APPROVAL: The ERC gave ethical review approval

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin

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CONFLICT OF INTEREST: No competing interest declared.

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