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ANEMIA IN PREGNANCY: PREVALENCE AND RISK FACTORS

Introduction

Anemia during pregnancy remains a major global health concern, affecting approximately 30–40% of pregnant women and contributing significantly to maternal and perinatal morbidity [1, 2]. The condition is primarily driven by iron deficiency, increased physiological demands, and gestational hemodilution. The progressive expansion of plasma volume, particularly during the second trimester, results in a relative decrease in hemoglobin concentration, often masking underlying pathological anemia. Hematological indices such as hemoglobin (Hb), red blood cell count (RBC), and mean corpuscular volume (MCV) are fundamental in assessing maternal hematological status [3]. However, the interaction between these parameters and maternal characteristics, including body mass index (BMI), gestational age, and parity, is not always clearly defined in small-scale clinical datasets. Recent studies suggest that maternal nutritional status, reflected by BMI, may significantly influence hematological outcomes [4].

Goal

The aim of this study was to investigate the relationship between hematological parameters (Hb, RBC, MCV) and maternal variables (BMI, age, gestational age), to determine predictors of anemia, and to develop a multivariate prediction model with an associated clinical risk scoring system.

Material and methods of research

A cross-sectional analytical study was conducted including 25 pregnant women hospitalized in obstetrical departments of Gomel City Clinical Hospital No. 3. The dataset included maternal age, BMI, parity, gestational age, and hematological parameters (RBC, Hb, MCV). Anemia was defined as hemoglobin levels below 110 g/L.

Statistical analysis involved Pearson correlation, multiple linear regression, logistic regression, analysis of variance (ANOVA), and stratification by trimester. A power analysis was also performed to assess the adequacy of the sample size. Statistical processing was carried out using JASP and Excel, and the results were subsequently reviewed for accuracy.

The results of the research and their discussion

The prevalence of anemia in the studied cohort was 24% (6 out of 25 patients). The analysis demonstrated that BMI had the strongest association with hematological parameters, particularly hemoglobin concentration.

Correlation analysis revealed a moderate positive relationship between BMI and hemoglobin ($r=0.47$), as well as between BMI and RBC count ($r=0.36$). In contrast, gestational age demonstrated a weak negative correlation with hemoglobin ($r=-0.11$) and a moderate negative correlation with MCV ($r=-0.28$), suggesting a trend toward microcytosis as pregnancy progresses. Maternal age showed only weak correlations with hematological parameters (Table 1).

Table 1 – Correlation Between Hematological Parameters and Maternal Variables

Parameter	BMI	Age	Gestational Age
RBC	0.36	0.18	−0.08
Hb	0.47	0.29	−0.11
MCV	0.17	0.05	−0.28

Multiple linear regression analysis confirmed that BMI was the only statistically significant predictor of hemoglobin levels. The model explained 35% of the variance in hemoglobin (R^2=0.35, p=0.025). BMI demonstrated a significant positive effect (β=0.92, p=0.008), indicating that each unit increase in BMI was associated with an increase of approximately 0.9 g/L in hemoglobin concentration. Age and gestational age did not reach statistical significance.

The RBC model showed a weaker association (R^2=0.19, p=0.202), with BMI approaching statistical significance (p=0.054). The MCV model was not statistically significant overall (R^2= 0.16, p=0.286), although gestational age demonstrated a borderline negative association (β =−0.20, p=0.085).

Table 2 – Multiple Regression Analysis of Hematological Parameters

Dependent Variable	Predictor	β Coefficient	p-value
Hb	BMI	+0.92	0.008
Hb	Age	+0.46	0.264
Hb	GA	−0.33	0.238
RBC	BMI	+0.02	0.054
MCV	GA	−0.20	0.085

Logistic regression analysis was performed to identify predictors of anemia. The model was statistically significant (p=0.0089) with a pseudo R^2 of 0.39, indicating good explanatory power for a clinical dataset. BMI emerged as the only significant independent predictor of anemia (β =−0.40, p=0.030). This suggests that each unit increase in BMI reduces the odds of anemia by approximately 33%. Neither age nor gestational age showed significant independent effects.

Analysis of variance demonstrated no association between parity and anemia (p=0.946), whereas BMI category showed a significant relationship (p=0.006). Patients with BMI ≥25 had significantly higher hemoglobin levels and a lower prevalence of anemia compared to those with BMI <25.

Stratification by trimester revealed that anemia prevalence was highest in the second trimester, affecting 50% of patients, compared to 0% in the first trimester and 22% in the third trimester. This represents a relative increase of more than 100% in anemia prevalence during the second trimester compared to later stages, consistent with physiological hemodilution.

A clinical risk scoring system was developed based on the most relevant predictors. Low BMI (<25) and second trimester status were the strongest contributors to anemia risk. Younger maternal age had a minor contribution. Patients with higher scores demonstrated a substantially increased probability of anemia.

Power analysis revealed a large effect size (Cohen's d=0.96) for the difference in hemoglobin levels between BMI groups. The required sample size to achieve 80% statistical power was approximately 18 patients per group, indicating that the present study is adequately powered for detecting large effects but may be underpowered for smaller associations.

Table 3 – Most Significant Predictors of Anemia

Variable	Effect Direction	Statistical Significance
BMI	Protective	p = 0.030
BMI category	Protective	p = 0.006
2nd trimester	Risk factor	Observational (50%)
Age	Minimal effect	p = 0.935
Parity	No effect	p = 0.946

Conclusions

The findings of this study demonstrate that maternal BMI is the most significant determinant of hematological status and anemia risk during pregnancy. Lower BMI is strongly associated with reduced hemoglobin levels and increased likelihood of anemia, while higher BMI exerts a protective effect. The second trimester represents the period of highest vulnerability, with a twofold increase in anemia prevalence compared to later stages of pregnancy.

In contrast, maternal age and parity do not significantly influence anemia risk in this cohort. The developed multivariate model and risk scoring system provide a practical framework for early identification of high-risk patients and may contribute to improved antenatal screening and targeted interventions. Further studies with larger sample sizes and inclusion of biochemical markers such as serum ferritin are required to validate these findings and refine predictive accuracy.

LITERATURE

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ASSOCIATION BETWEEN BODY MASS INDEX (BMI) AND MENSTRUAL IRREGULARITIES AMONG YOUNG WOMEN

Introduction

Menstruation is one of the most important physiological milestones of adolescence, marking the maturation of the female reproductive system. It follows a cyclical pattern usually monthly and continues as a normal biological process from the onset of menarche until menopause. During adolescence, menstrual irregularities are quite common because the hormonal pathways that regulate the cycle are still developing. For this reason, the menstrual cycle is often viewed as a sensitive indicator of reproductive and endocrine health in young women [1]. Body mass index (BMI) is one of the key factors known to influence menstrual regularity. As a widely used measure of nutritional