Effect of maternal anemia on perinatal outcomes in mothers with mild preeclampsia. A cross-sectional study

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Abstract

Background: One of the most common nutritional deficiencies that pregnant women have is anemia. Both the mother and the fetus' lives are in danger from anemia. There is ongoing debate over how much maternal anemia affects both maternal and newborn health. Preeclampsia is also linked to a constriction of the plasma volume, with evidence of diminished plasma volumes both throughout pregnancy and after delivery.

Objectives: Studying the impact of maternal anemia during the third trimester on birth weight at delivery in a sample of infants whose mothers had mild preeclampsia is the goal of the study.

Methodology: All patients were subjected to careful history-taking through clinical examination and laboratory investigations, including CBC, liver functions, and renal functions. Apgar score and birth weight were recorded for the studied neonates.

Results: A comparison between patients with normal and low Hb levels showed that neonates of mothers with normal Hb levels had significantly higher birth weight when compared with those with low Hb levels.

Conclusion: There was an indirect correlation between maternal anemia and neonatal birth weight in women with mild preeclampsia.

Key words: Maternal anemia, neonatal birth weight, preeclampsia.

Introduction

In both developed and developing countries, preeclampsia is common. According to the World Health Organization, high blood pressure during pregnancy accounts for 16% of maternal deaths in developed nations and up to 25% in underdeveloped nations [1].

Preeclampsia is a placental syndrome that manifests clinically late in pregnancy and causes maternal hypertension, proteinuria, and occasionally malfunction of the liver and central nervous system [2].

Preeclampsia is the main factor in intrauterine growth

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restriction, miscarriages, and stillbirths, as well as maternal and neonatal morbidity and mortality [3].

Moderate-to-severe maternal anemia has been identified as a factor in poor maternal and perinatal outcomes. Given that there was a substantial chance of low birth weight [4],.

Accordingly, the inverse relationship between maternal hemoglobin concentration and newborn size is most likely caused by a reduction in plasma volume. Preeclampsia is associated with maternal hemoconcentration, which is often attributed to decreased plasma volume expansion and is also an identified risk factor for poor perinatal outcomes due to plasma volume constriction [5].

So an evaluation of the relationship between maternal anemia and fetal birth weight in cases of preeclampsia may be needed.

Patients and methods

The present study is a cross-sectional case-control study. It was conducted at the Obstetrics and Gynecology Department, Faculty of Medicine, Suez University, on 200 patients with mild preeclampsia. The presence of proteinuria > 300 mg during 24 hours of collection without end-organ damage, as well as hypertension (blood pressures of > 140/90 mm Hg and less than 160/110 mm Hg) on 2 different occasions at least 6 hours apart, were both considered to be indicators of mild preeclampsia [6].

Before involving the patients in the trial, their signed informed consent was obtained. The study's participants were split into two groups according to their hemoglobin level prior to delivery within 48 hours; group A included 100 patients whose hemoglobin level was within normal. WHO defines a normal hemoglobin level as a level above 11.0 g/dl [7]. Group B included 100 patients whose hemoglobin level was lower than normal.

Exclusion criteria included patients with HELLP syndrome (hemolysis, elevated liver enzymes, low platelets), gestational diabetes, cyanotic heart disease, chronic hypertension, chronic renal disease, asthmatic patients, severe malnutrition cases, low maternal age patients, patients with blood diseases, cases with severe preeclampsia, smoker patients, twin pregnancies, and cases that needed blood transfusion.

Methods

A detailed history was taken from the patients, including personal information such as name, age, special habits, occupation, and address. Menstrual history was taken, including the first day of the last menstrual period and the estimated gestational age by date. Obstetric history included parity, gravidity, and symptoms of preeclampsia. Her medical history included diabetes mellitus, hypertension, blood diseases, drug intake, and whether she used iron supplements or not. Family history included diabetes mellitus, hypertension, and congenital anomalies. A general examination included measurements of blood pressure, pulse, and temperature; the presence of pallor or jaundice; and the presence of petichae or ecchymosis of the skin to exclude the presence of coagulation defects or blood diseases. Abdominal examination to detect the size of the uterus, scars from previous operations, and edema. Investigations done on mothers included a complete blood picture within 48 hours prior to delivery, prothrombin time, partial thromboplastin time, random blood glucose, urine analysis, and liver and renal function tests. Doppler ultrasound was performed to exclude placental insufficiency as a cause of LBW. The following was done to the newborn as an assessment of gestational age at delivery, birth weight at delivery, and Apgar score.

Ethical considerations

The investigator kept a list of sub-

investigators and other suitably competent individuals to whom substantial trial-related activities were assigned and made sure that everyone helping with the trial was properly informed about the protocol and the trial-related duties.

Patient information and informed consent

Before being admitted to the clinical trial, the patients were informed about the nature, scope, and possible consequences of the clinical trial in a way that was understandable to them.

Confidentiality

In the case report form, the patients' numbers and initials were the only information entered. The investigators maintained patient privacy whenever the patient's name appeared on any other document (such as a pathology report or reservation note). In order to identify records and facilitate communication with patients, the investigator initially retained the patients' identifying information, including their numbers, names, and contact details.

Protocol approval

The protocol and all related documents were declared for ethical and research approval by the ethical committee, Faculty of Medicine, Suez University.

Statistical analysis

Using the Statistical Package for Social Science (BM Corp., 2011), the gathered data was updated, coded, tabulated, and brought onto a PC. Armonk, NY: BM Corp., BM SPSS Statistics for Windows, Version 20.0. Data were shown, and appropriate analysis was carried out based on the kind of data found for each parameter.

Results

In the present study, comparisons between mothers with normal and low hemoglobin levels regarding maternal characteristics showed no significant differences between women with normal and low Hb regarding maternal age and BMI (Table I).

Also, there were no statistically significant differences between patients with normal and low Hb regarding preeclampsia features, including systolic and diastolic blood pressure (Table II).

In addition, there were no significant differences between patients with normal and low Hb regarding WBCs, platelets, glucose, bilirubin, PT, and creatinine levels (Table III).

In the present study, comparisons between patients with normal and low Hb levels showed that neonates of mothers with normal Hb levels had significantly higher birth weight when compared with those with low Hb levels (Table IV).

However, no statistically significant differences were found between both groups regarding gestational age and Apgar score. Importantly, there was a direct correlation between maternal hemoglobin and neonatal weight in women with mild preeclampsia (Table V).

Discussion

Anaemia during pregnancy affects over half of all pregnant women worldwide, and this is a severe global health concern. Iron deficiency is the most common cause of anemia during pregnancy; deficits in other micronutrients are less common [8].

Anaemia is one of the most prevalent dietary deficiencies affecting expecting moms. The two criteria used to determine anemia are hemoglobin levels falling below 11 gm% and hematocrit levels falling below what is thought to be typical for a certain individual [9].

There is an antagonistic link between anemia and unfavorable birth outcomes. Low birth weight and premature delivery are significantly increased by anemia; nevertheless, other contentious research could not find any correlations [10].

Other research indicates that there isn't a link between low pregnancy outcomes and maternal anemia [11].

A number of investigations that shown a higher frequency of low birth weight in conjunction with a high level of hemoglobin in the mother attest to the importance of suitable expansion of the plasma volume in enabling the best possible growth of the fetus [12].

A U-shaped curve connection between maternal haemoglobin concentrations and pregnant trimesters was seen in most studies. Therefore, pregnant women with moderate-to-severe anemia had an approximately twofold risk of low birth weight babies during the first and second trimesters; the association was the opposite during the third trimester [13].

When comparing the maternal characteristics of mothers with normal and low hemoglobin levels, the current study did not find any statistically significant differences in either maternal age or BMI.

This is in line with the findings of Bencaiova et al. (2012), who support the prevalence of anemia and low iron stores in expectant mothers as well as their analysis of the relationships between risk factors such as age, parity, body mass index (BMI), sociodemographic background, and abnormal iron status or hemoglobin levels. This study [14] demonstrated that moms over the age of thirty were the only ones who were at risk for developing anemia.

Neonatals of mothers with normal hemoglobin levels had significantly larger birth weights than those of mothers with low hemoglobin levels, according to the current study's comparison of patients with normal and low hemoglobin levels. The correlation study, which demonstrated a direct relationship between mother hemoglobin and newborn birth weight, further supported these findings. This is consistent with a research by Bodeau-Livinec et al. (2011), which discovered a link between lower birth weight and maternal anemia [15].

However, Amburgey et al. (2009) sought to determine whether birth weight would show an inverse relationship to hemoglobin concentration in a group of infants whose mothers had preeclampsia, a condition in which plasma volume constriction is common. After reviewing both paper and computerized charts, 142 nulliparous women with preeclampsia were found (low platelets syndrome, increased liver enzymes, and hemolysis were excluded). To determine the birth weight percentile, cross-sectional hybrid growth curves were utilized. Measurements were made of the mother's hemoglobin level during the third trimester. The average gestational age at delivery was 35.9 +/- 1.9 weeks. The mean hemoglobin z-scores of mothers with preeclampsia were significantly greater than those of the control group. Maternal hemoglobin levels and birth weight had a negative correlation. The scientists came to the conclusion that there is a statistically significant inverse relationship between the percentile of birth weight and the mother's hemoglobin concentration [16].

The discrepancy between the results of our investigation and the prior study could be attributed to the diverse characteristics of the individuals analyzed; in contrast to the anemia observed in our study, the majority of patients in the previous study showed hemoconcentration. This is explained by the fact that the patients in our study had moderate preeclampsia.

Conclusion

Mothers with mild preeclampsia and normal Hb levels had significantly higher birth weight when compared with those with mild preeclampsia and low Hb levels.

Conflict of interest

None

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Table I: Comparison between mothers with normal and low hemoglobin levels regarding the demographic characteristics

	Normal Hb (n=100)	Low Hb (n=100)	Student T test	
			t	p
Age (years)	23.3 ± 2.4	23.9 ± 2.9	-1.18	0.24
BMI (Kg/m²)	28.3 ± 1.8	27.9 ± 1.5	1.32	0.18

Table II: Comparison between mothers with normal and low hemoglobin levels regarding preeclampsia features

	Normal Hb (n=100)	Low Hb (n=100)	Student T test	
			t	p
SBP (mm Hg)	149.4 ± 6.0	150.5 ± 6.7	-0.87	0.38
DBP(mm Hg)	95.3 ± 3.2	95.0 ± 2.9	0.61	0.53

Table III: Comparison between mothers with normal and low hemoglobin levels regarding the other laboratory findings

	Normal Hb (n=100)	Low Hb (n=100)	Student T test	
			t	p
WBCs (×103/ml)	8.35 ± 1.7	8.53 ± 1.68	-0.52	0.6
Platelets (×103/ml)	304.8 ± 66.4	318.3 ± 59.7	-1.07	0.28
Random bl. Glucose (mg/dl)	154.8 ± 9.0	153.0 ± 10.1	0.94	0.34
Total Bilirubin (mg/dl)	0.8 ± 0.17	0.81 ± 0.23	-0.28	0.77
PT (sec.)	13.1 ± 0.9	13.0 ± 0.8	0.7	0.48
Creatinine (mg/dl)	0.86 ± 0.18	0.82 ± 0.17	1.22	0.22

Table IV: Comparison between mothers with normal and low hemoglobin levels regarding the neonatal parameters

	Normal Hb (n=100)	Low Hb (n=100)	Student T test	
			t	p
Gestational age (wks)	37.9 ± 1.43	38.2 ± 1.34	-1.07	0.28
Neonatal weight (gm)	3100 ± 220	2900 ± 220	-4.48	0.04*
Apgar score	8.1 ± 1.5	8.0 ± 1.5	0.26	0.79

Table V: Correlation between maternal hemoglobin level and the neonatal parameters

	Hb	
	R	P
Gestational age	-0.11	0.26
Neonatal weight	0.86	*0.04
Apgar score	0.048	0.63