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Evaluation the anemia status among preeclamptic pregnants in hospital inpatients from Şanlıurfa, Turkey

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Abstract

Pre-eclampsia is common in the region who are underserved to antenatal care services and constitute risk of anemia.To evaluate the anemia status and its contributing factors in pregnant women a diagnosis of Pre-Eclampsia. This cross-sectional study was conducted from October 2012 to January 2013. This study involved 128 pregnant women hospitalized with a diagnosis of Pre-Eclampsia who consented to being study subjects were included. Statistical analysis was performed using descriptive statistics, Chi-square test, Student's t-test, ANOVA and Pearson's correlation, Binary logistic regression coefficient. Average (±1 SD) and percent frequency values were: Age, 31.53±6.43 years; parity 2.96±1.51; cesarean section at last birth, 40.6%; unplanned pregnancy, 28.1%; use of iron and vitamin pills, 100%; presence of anemia (i.e. blood hemoglobin (Hb) <11), 25%; average Hb, 11.93±1.49 g/dL; and hematocrit (Hct), 35.33±4.05%. No significant effect of the considered socio-demographic factors was observed. A significant difference was observed in the frequency of anemia between patients whose preceding delivery had been by cesarean section and those with regular delivery (32.7% *vs.* 11.6%, respectively, p=0.044). Statistically significant negative correlation could be detected between pregnancy intervals and anemia (OR, 0.74). Anemia is important factor in the etiology of Pre-Eclampsia, despite access to sufficient prenatal care, these pregnant patients is common frequently. Previous delivery method appears to play a role in the development of anemia. These pregnant patients may be at increased risk due not only to Pre-Eclampsia but also to their anemia.

Keywords: Pregnancy, pre-eclampsia, anemia, patient

Introduction

Pre-Eclampsia and eclampsia, grouped under the general term "toxemia", complicate 4-18% of pregnancies in developing countries with hypertensive disorders [1]. Worldwide, 12% of maternal deaths are a result of eclampsia, making it the third most common cause of maternal mortality [2]. The next report of the World Health Organization (WHO) indicated the condition as second most common cause of maternal death: 18% of deaths in mothers are linked to hypertension [3]. In Turkey, 13.7% of deaths during pregnancy are due to eclampsia, while 18.4% of maternal deaths are listed as being due to a combination including edema, proteinuria and hypertension; eclampsia is thus the second most common cause of maternal death in Turkey [4]. Pre-Eclampsia is defined as hypertension (BP >140/90 mmHg) associated with proteinuria past the 20th week of pregnancy and is classified as a pregnancy-induced hypertension [5].

A condition seen in human pregnancy only, its etiology has not been completely elucidated; [5] although anemia and folic acid deficiency are known to be risk factors for Pre-Eclampsia [6]. Anemia is defined as blood hemoglobin (Hb) levels below normal values [7]. WHO defines anemia as Hb values under 11 g/dL in any of the trimesters of pregnancy, a definition still valid in clinical practice [8].

According to WHO data, 1.62 billion people (24.8% of the world population) are or have been anemic. Pregnant women are the group most affected; 56 million pregnant women (41.8%) are reported to be anemic [8, 9].

The anemic pregnancy prevalence by WHO regions is highest in Africa (57.1%), followed by Southeast Asia (48.2%), while it is lowest in Europe (25.1%) and America (24.1%).[8] A 2008 report of the WHO reported that 40.2% of pregnant women are anemic [8].

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Conditions causing the onset of anemia in women in their fertile years include multiple pregnancies, intervals shorter than two years between pregnancies, nutritional insufficiency [10]. Severe anemia in pregnancy has damaging effects on maternal and fetal health [11]. A five-fold increase in maternal death is observed in anemic pregnant women, who often experience complications such as obstetrical bleeding, shock and effect as development Pre-Eclampsia [12].

The objective of this study was to estimate the prevalence of anemia in preeclamptic pregnant women and to study the correlations between anemia and suspected sociodemographic and obstetrical influencing factors. Additionally, we aimed at underlining the importance of correcting anemia, a pathogenic factor in toxemia, already in the preconceptional stage, in order to prevent the development of Pre-Eclampsia.

Material and Methods

This is a cross-sectional study conducted at the Sanlıurfa Gynecological and Obstetrical State Hospital between October 2012 and January 2013 and was designed estimate the prevalance of anemia in pre-eclamptic pregnant women.

In the 4-month period, 147 pregnant women were admitted complaints of pre-eclampsia. 12 pregnant women diagnosed with Hipertansion and 7 pregnant with severe Pre-Eclampsi. Participants in the study were 128 pregnant women who hospitalized as inpatients with a diagnosis of Pre-Eclampsia.

A Personal Data Form prepared by the investigator based on a literature review. It contained 29 questions regarding the subject's sociodemographic characteristics and data on pregnancy, delivery, neonate and laboratory values. This form was applied to the patients face to face interviews.

The complete history of the study, patients and their laboratory values were completely reviewed to determine their age, education status, previous history of abortion, stillbirth, gravidity and values of hemoglobin and hemotocrit. This study of serum analysis was obtained from patient files.

The inclusion criteria of the study were the diagnosis of Pre-Eclampsia, maternal age of 18-40 years, gestational age over 20 weeks, The exclusion criteria were severe Pre-Eclampsia and unconscious patients.

The diagnosis of Pre-Eclampsia was based on the American Congress of Obstetricians and Gynecologists (ACOG) and National High Blood Pressure Education Program (NHBPEP) criteria (5,13); patients with a sitting diastolic and systolic blood pressure of 90 and 140 mmHg, respectively, at least twice over a 6-hour interval and either proteinuria greater than 300 mg in 24-hour urine or a ≥ 1+ dipstick result were deemed as having mild Pre-Eclampsia. Patients with a systolic blood pressure of 160 and diastolic pressure of 110 mmHg or higher at the time of admission, with more than 5 g of protein in their 24-hour urine, and who had received magnesium sulfate ($MgSO_4$) treatment were considered to have severe Pre-Eclampsia.

Additionally, the anemia definition used was that defined by the WHO in 2001 as a blood Hb level <11 g/dL in all three trimesters of pregnancy, a criterion that is still valid [8]. The study protocol has been revised by the Ethical Committee of Harran University, and verbal consent was obtained from the patients (Institution Approval:04.09.2012-26546; Ethics Committee Approval: 14.12.2012/5-2).

The SPSS for Windows 22.0 (Statistical Package for Social Sciences) software package was used for study data evaluation. Data were described as average, standard deviation, mean, range, percentages and were analyzed Chi-squared test, Student's t-test, ANOVA and Pearson's correlation coefficient. All evaluations were performed for a 95% confidence interval; significance threshold was set at a p-value of 0.05 and a $p<0.01$ was considered highly significant.

Results

The subjects were aged 31.5±6.43; 89.1% had completed primary school, 95.3% were not gainfully employed, 38.3% lived outside the province and 95.3% were covered by Social Security (Table 1).

As for obstetrical data, subjects were in their 33rd-34th (range, 22.5-40) weeks of pregnancy with 2.96±1.51 past pregnancies. While 21.1% were in their first pregnancy, 40.6% were in the fourth or more; 12.5% had had 4 or more deliveries. Patients who had experienced their most recent delivery by cesarean section made up 40.6%, 5.5% had had a stillbirth, 39.8% had a history of miscarriage and 14.8% had miscarried during their most recent pregnancy (Table 2). The time interval between the most recent pregnancy and the current pregnancy was shorter than two years in 18% of the cases.

The current pregnancy was unplanned in 28.1% of patients. All reported that they had obtained prenatal care during the current pregnancy, provided by only a physician in 75% of subjects and with the additional participation of a nurse or midwife in the remaining 25%. In 21.1% of cases, the patients had received prenatal care four times or less during the current pregnancy. In the majority of cases (64.8%), this service had been provided by a public obstetrical clinic and least frequently (18.8%) by a Family Health Center. All patients reported using iron and vitamin pills as a result of their prenatal care visits. The study patients were nonetheless anemic (Hb <11 g/dL) in 25% of

the cases. Average Hb and Hct were 11.93±1.49 g/dL and 35.33±4.05%, respectively (Table 3).

Table 1. Distribution of sociodemographic and obstetrical characteristics of pregnant women with Pre-Eclampsia.

Variables			Total*	
	n	%	N	%
Age				
18 -29	**48**	**37.5**	128	100.0
30-34	**32**	**25.0**		
≥35	**48**	**37.5**		
Education Status				
Primary school	**114**	**89.1**	128	100.0
High School or higher	**14**	**10.9**		
Occupation				
Gainfully occupied	**6**	**4.7**	128	100.0
Not gainfully occupied	**122**	**95.3**		
Social Security Status				
Yes	**6**	**4.7**	128	100.0
No	**122**	**95.3**		
Place of Residence				
District center	**79**	**61.7**	128	100.0
Other province	**49**	**38.3**		
Gravidity				
1	**27**	**21.1**	128	100.0
2-3	**49**	**38.3**		
≥4	**52**	**40.6**		
Parity				
None	**33**	**25.8**	128	100.0
1-3	**79**	**41.7**		
≥4	**16**	**12.5**		
Number of Live Children				
None	**34**	**26.6**	128	100.0
1-2	**62**	**48.4**		
3 or more	**32**	**25.0**		
Stillbirths				
Yes	**7**	**5.5**	128	100.0
No	**121**	**94.5**		
Intentional or Spontaneous Abortions				
Yes	**51**	**39.8**	128	100.0
No	**77**	**60.2**		
Method of Preceding Delivery				
No	**33**	**25.8**	128	100.0
Vaginal	**43**	**33.6**		
Cesarean section	**52**	**40.6**		

[a]*The totals are for the columns.*

Table 2. Distribution of hemoglobin and hemtocrit values of preeclamptic pregnant subjects and presence of anemia.

Variables	Minimum	Maximum	Mean ± Standard deviation	
Hb[a] (g/dL)	**8.20**	**15.30**	11.93±1.49	
Hct[b] (%)	**25.80**	**45.50**	35.33±4.05	
			Total[c]	
	n	**%**	**N**	**%**
Anemia Diagnosis[d]				
Yes	**32**	**25.0**	128	100.0
No	**96**	**75.0**		

[a]*Hb: hemoglobin,* [b]*Hct: hematocrit,* [c]*The totals are for the columns .*[d]*Patients with Hb level <11g/dL were deemed anemic.*

Table 3. Distribution of hemoglobin and hemtocrit values of preeclamptic pregnant subjects according to sociodemographic characteristics.

Variables	Hb (g/dL) Mean ± SD	Hct % Mean ± SD	Hb		Hct	
			t[a]/ F[b]	p-value	t[a]/ F[b]	p-value
Age						
18 -29	11.91±1.35	35.37±3.99	**1.531**[b]	0.220	**1.331**[b]	0.268
30-34	11.59±1.45	34.40±3.87				
≥35	12.18±1.62	35.91±4.20				
Education Status						
Primary	11.95±1.51	35.37±4.11	**0.374**[a]	0.709	**0.305**[a]	0.761
High school or higher	11.79±1.32	35.02±3.66				
Gainful Employment						
Yes	11.98±0.75	35.22±1.69	**-0.084**[a]	0.934	**0.073**[a]	0.942
No	11.93±1.52	35.34±4.14				
Social Security Status						
Yes	11.95±1.49	35.39±4.02	**-0.646**[a]	0.520	**-0.701**[a]	0.485
No	11.55±1.50	34.20±4.91				
Place of Residence						
District center	11.92±1.42	35.21±3.93	**0.092**[a]	0.927	**0.457**[a]	0.649
Other province	11.95±1.60	35.54±4.28				

[a]*Student's t-test* [b]*ANOVA F*

The distributions of Hb and Hct values according to sociodemographic and obstetrical characteristics are shown in Tables 4 and 5.

Comparative tests failed to show a significant correlation between the presence of anemia and any of the following sociodemographic characteristics: age group, education status, occupation, place of residence or access to social security. As for obstetrical characteristics, a significant difference was observed regarding the presence or absence of anemia between patients whose preceding delivery had been by cesarean section and those with vaginal delivery (32.7% vs. 11.6%, p=0.044) (Table 5).

Table 4. Distribution of hemoglobin and hemtocrit values of preeclamptic pregnant subjects according to obstetrical characteristics.

Variables	Hb (g/dL) Mean ± SD	Hct % Mean ± SD	Hb		Hct	
			t[a]/ F[b]	p-value	t[a]/ F[b]	p-value
Gravidity						
1	11.84±1.40	35.26±4.09	**2.292**[b]	0.105	**2.122**[b]	0.124
2-3	11.64±1.45	34.51±3.87				
≥4	12.26±1.53	36.15±4.12				
Parity						
0	11.84±1.39	35.12±4.01	**0.953**[b]	0.388	**0.883**[b]	0.416
1-3	11.87±1.53	35.17±4.14				
≥4	12.41±1.45	36.59±3.71				
Stillbirth History						
Yes	12.37±1.37	35.86±4.75	**-0.800**[a]	0.425	**-0.350**[a]	0.727
No	11.91±1.49	35.30±4.03				
Intentional or Spontaneous Abortion History						
Yes	11.94±1.42	35.37±3.97	**-0.023**[a]	0.982	**-0.086**[a]	0.931
No	11.93±1.54	35.31±4.13				
Method of Preceding Birth						
No	11.84±1.39	35.12±4.01	**2.110**[b]	1.880	**0.126**[b]	0.157
Vaginal Delivery	12.30±1.43	36.27±4.04				
Casarean section	11.69±1.56	34.69±4.03				

[a]*Student's t-test* [b]*ANOVA F*

Table 5. Distribution of the number of prenatal care visits and method of preceding birth according to presence or absence of anemia.

Variables	Anemia		No Anemia		Total[a]			
	n	%	n	%	n	%	χ2	p-value
Method of Preceding Birth								
No	10	30.3	23	69.7	33	100.0	6.237	***0.044****
Vaginal Delivery	5	11.6	38	88.4	43	100.0		
Casarean section	17	32.7	35	67.3	52	100.0		
Number of prenatal visits								
4 or fewer	7	25.9	20	74.1	27	100.0	0.016	0.900
5 or more	25	24.8	76	75.2	101	100.0		

[a]*The totals are for the columns.* **p<0,05*

No statistically significant differences were detected for the presence of anemia in regards to gravidity, parity, number of miscarriages, the distribution of prenatal care visit numbers, their particular character, facility and professional characteristics also failed to show any significant correlations. Similarly, no statistically significant correlation could be detected between the subjects' age and their Hb or Hct values.

Nevertheless, according to using suitable model in Binary logistic regression analysis, statistically significant negative correlation could be detected only between pregnancy intervals and anemia (OR, 0.74) (Table 6). When pregnancy intervals were increases, the anemia were decreases.

Table 6. Risk factors for Anemia in Logistic Regression

Variables	P[a]	B	OR	95% CI	
				Min	Max
Number of Pregnancy	0.979	0.002	1.14	0.160	0.164
Pregnancy Interval	0.011	-0.037	0.74	0.064	0.007
Method of Preceding Birth	0.171	-0.071	0.44	0.172	0.031
Abortus History	0.718	-0.019	0.87	0.125	0.086
Gestation week	0.749	-0.003	0.33	0.023	0.016

[a] *Binary logistic regression analysis was used (OR, odds ratio; CI, confidental intervals).*

Discussion

The anemia definition used was that defined by the WHO as a blood Hb level <11 g/dL in all three trimesters of pregnancy [8]. In women, iron deficiency anemia is the most common type of anemia [8]. According to a WHO report, the public health problem represented by anemia in pregnancy is serious in 68 countries, moderate in 91 and mild in 33 [8]. A 2008 report of the WHO indicated that 40.2% of pregnant women in Turkey are anemic [8]. The frequency of anemia in women of childbearing age in Turkey was reported as 32.8-40.0% [14].

The preeclamptic patients in our study were anemic (blood Hb <11 g/dL) in 25% of the cases. Their average Hb and Hct were 11.93±1.49 g/dL and 35.33±4.05%, respectively. Arslan *et al.* reported an average maternal Hb level of 11.1±1.5 g/dL for an Hct of 33.9±4.5% [15]. The average Hb and Hct values in pregnant women reported by Dane *et al.* were, respectively, 11.07±1.5 g/dL and 33.9±4.5%, with Hb values of 9.7±0.9 g/dL in the anemic group and 12.3±0.8 g/dL in the others [14]. In our study, the corresponding Hb values were 10.01±0.70 g/dL for the anemic patients and 12.57±1.07 g/dL in the others, levels consistent with those in published reports.

Endeshaw *et al.* found, however, an anemia prevalence of 11.9% in preeclamptic pregnant women, notably lower than was found in our study; they reported a correlation between anemia and Pre-Eclampsia and a 3.5-fold increased frequency of anemia in preeclamptic pregnancies compared to healthy ones. It was proposed that such increased sensitivity could be explained by a deficiency in micronutrients and antioxidants in preeclamptic pregnant women. The mentioned report also indicated that anemia is a risk factor in the development of Pre-Eclampsia. It coincided with a more than two-fold increase in the incidence of Pre-Eclampsia in pregnancy [6]. Additional studies have also indicated that anemia plays a role in hypertension and Pre-Eclampsia in pregnant women [6,11,16].

The maternal and fetal effects of anemia accompanying Pre-Eclampsia, especially severe anemia, are well known. On the maternal side, preterm labor, early rupture of membranes, miscarriage, postpartum hemorrhage, congestive heart failure, increased risk of puerperal sepsis, stillbirth and maternal death are possible. On the perinatal side, low birth weight, preterm birth, intrauterine growth delay and low Hb and Hct values are the expected complications [11,14,16].

Ali *et al.* found a significant correlation between the presence of severe anemia and the development of Pre-Eclampsia (OR 3.6, 95% CI 1.4-9.1, p 0.007) and also between severe anemia and preterm labor, stillbirth and low birth weight; the risk of low birth weight was increased by a factor of 2.5 in mothers with moderate anemia, compared to those who were not anemic [11].

In reporting the results of a one-year study, Rohilla *et al.* called awareness to the importance of severe anemia in pregnancy on safe labor and healthy neonates, noting that untreated severe anemia may lead to early membrane rupture, preterm labor, hypertension, miscarriage, postpartum hemorrhage, low birth weight and maternal death, all of which are preventable if diagnosed early [16].

Arslan *et al.* found a significantly higher proportion of low birth weight infants from anemic mothers compared to others (p=0.029). The newborn children of anemic mothers had significantly lower Hb and Hct levels compared to others (p=0.026 and p=0.006, respectively) [15].

Darkhaneh *et al.* found blood test values to be different in preeclamptic versus healthy pregnant women; first and fifth-minute Apgar scores were significantly lower in the newborns of the preeclamptic group [17].

Considering all of the above, the need to screen pregnant women for anemia and to correct this condition before birth, as well as the need for measures to prevent the problem becomes especially significant with regard to Pre-Eclampsia development. For many years, reports have been stressing the role of diet and folic acid intake in the development and prevention of Pre-Eclampsia [6].

To this end, prenatal care visits and anemia screening should be increased. It was proposed in Turkey that every pregnant woman should have at least four quality follow-up visits and six postpartum care visits. As for the prevention of iron deficiency anemia, the Turkish Ministry of Health directive implemented in 2007 recommends an iron supplementation program with 40-60 mg daily elemental iron for nine months, starting in the 4th month of pregnancy in the second trimester, and continuing for three months postpartum [10,18]. In our study, even though all pregnant subjects with Pre-Eclampsia had been receiving prenatal care, in 78.9% of cases with five or more visits, and all reported taking iron and vitamin supplements, one fourth of the patients had anemia. We are tentatively attributing this situation to irregular treatment due to gastrointestinal complaints or the patient's decision to interrupt treatment.

When examining other factors possibly influencing the development of anemia in pregnancy, published reports have indicated that conditions such as the women's age,[19] education status,[20] nutritional habits, [6] smoking status [21], gravidity [22], parity [23], and the interval between consecutive pregnancies [24] may play a role.

Our study failed to detect a significant correlation between anemia and sociodemographic characteristics, number of live children, history of miscarriage, abortion or stillbirth. Similar results have been reported by some other studies [15,25].

Nevertheless, in our study, negative correlation could be detected between pregnancy intervals and anemia (OR, 0.74).When pregnancy intervals were increases, the anemia were decreases (Table 6). In reporting the results of study on immigrant pregnant women, Sahin *et al* found similar results between hemoglobin levels and pregnancy intervals (p=0.01) [26]. As we know intervals shorter than two years between pregnancies is one of condition causing the onset of anemia in women [12]. In our study, however, the last delivery method seemed to be significant for the development of anemia. Anemia was more frequent in pregnant women whose last delivery had been by cesarean section than in those with vaginal delivery. Sources indicate a mean loss of blood of ≥1.500 mL during a cesarean section compared to ≥500 mL for a vaginal delivery [27]. Our results seem to suggest that this loss of blood has protracted effects extending to the next pregnancy. In a study of Hb and Hct values and anemia incidence before and after delivery in women having cesarean section or vaginal delivery with episiotomy, Karaalp *et al.* found that postpartum Hb and Hct were higher in the group with vaginal delivery-episiotomy; the postpartum drop of these values in women who underwent cesarean section was highly significant (p<0.01) [28]. This result seems to support our interpretation of the presence of anemia in our study. A study addressing the influence of the delivery method in the most recent previous pregnancy on the development of anemia in the current one could not be found in the literature.

The significant result that we obtained indicates a need to consider the most recent delivery method among the etiologic factors of anemia in pregnancy. Within the framework of the Turkish Ministry of Health policy of the last several years, there is an effort to reduce the frequency of cesarean sections and increase that of vaginal deliveries [29]. According to data from the 2013 Turkish National Health Survey, the frequency of cesarean sections in Turkey is 48% [30], while in the European rates range from 14.8% in Iceland to 52.2% in Cyprus [31]. The

mentioned new health policy may indirectly contribute to the prevention of Pre-Eclampsia considering our finding of a high incidence of anemia in women having concluded their last pregnancy with a cesarean section.

Even though many publications have reported that there is no specific method for the prevention of Pre-Eclampsia [6], our study subjects being pregnant women at risk for the maternal and fetal damage of Pre-Eclampsia may have resulted in a particularly severe picture of anemia, making treatment compulsory.

To conclude, even though all the women with Pre-Eclampsia in our study were already receiving prenatal care and taking iron supplements, anemia was still present in the study group. Correcting anemia in future mothers starting in the preconceptional stage should protect against the future risk of maternal and fetal risk of toxemia. We also believe that reducing the frequency of cesarean sections will contribute to the prevention of anemia in pregnancy. Further study of the contribution to the risk of anemia by the last used method of delivery is warranted.

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