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RESEARCH ARTICLE

EARLY PREGNANCY HEMOGLOBIN LEVELS AS PREDICTION OF PREECLAMPSIA

FICOG. Dr. Ekhlas Ali, CABOG.

Obstetrics and Gynecology Department, College of Medicine, Al-Iraqia University.

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Key words:-

Hemoglobin, Preeclampsia, prediction.

Abstract

Background:- Although preeclampsia is one of the most serious complications in pregnancy and an accurate prediction of preeclampsia is important for early diagnosis, a definitive screening test for early diagnosis is still elusive.

Objectives:- The current study is performed to evaluate the relationship between the maternal hemoglobin level in the first trimester of pregnancy and the incidence of preeclampsia.

Patients and Methods: The current study is a cross-sectional study, carried out at Al Noman Hospital in Baghdad; including 160 women who were almost on their 14th week of pregnancy and were attending prenatal clinic of this hospital from January 2015 to March 2016. After measuring their hemoglobin at first visit, the study subjects were monitored for preeclampsia until delivery, and the results of hemoglobin levels were compared between women who developed preeclampsia (80) and the control groups (80). The data was analyzed by using SPSS program version 22 and statistical programs version 9.

Results: The current study revealed a significance relation between hemoglobin value during the first trimester of pregnancy and preeclampsia among the study groups. It was found that the mean maternal hemoglobin level were significantly higher in preeclamptic patients 12.6 ± 1.3 g/dL versus non-preeclamptic women 11.5 ± 1.2 g/dL with a P value of <0.001 .

Conclusions:- The presence of high hemoglobin values in the first trimester of pregnancy can be used to predict preeclampsia and monitoring the pregnant women at risk for preeclampsia.

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Introduction:-

Preeclampsia is a pregnancy-specific disorder that refers to the onset of hypertension (blood pressure of $\geq 140/90$ mmHg) and proteinuria (24-hour urinary protein excretion of >300 mg) after 20 gestational weeks in a previously normotensive female. (1) It is the most common medical complication of pregnancy whose incidence has continued to increase worldwide, and it is associated with a significant maternal morbidity and mortality, accounting for about 50,000 deaths worldwide annually. (2,3) The prevalence of this disease in the world has been estimated at 8%–10%, and 20% in developing countries. The World Health Organization (WHO) estimates that preeclampsia is directly responsible for 10% of direct maternal mortality in Asia. (3,4) It has been determined that preeclampsia is the second leading cause of maternal death in developed countries. (5) Therefore, early detection of this problem, which

Corresponding Author:- Ekhlas Ali.

Address:- Obstetrics and Gynecology Department, College of Medicine, Al-Iraqia University.

involves careful monitoring of both mother and fetus, is an important issue. (3) However, there is a constant ongoing search for better predictors and prognostic factors to assess the progress and severity of the disease, hematological parameters being one among them. Currently there are no individual screening tests that are reliable, valid, and economical. (6)

It is well established that plasma volume increases by 50% during pregnancy. Red cell mass also increases, but relatively less in compare to plasma volume. The net result is a dip in hemoglobin (HGB) concentration results in dilution anemia during pregnancy. (7,8) Its absence has been associated with an increased tendency for stillbirths while its presence conveys benefits related to decreased blood viscosity and reduced resistances to blood flow culminating in increased perfusion of the placenta. (7) However; in women who have preeclampsia, blood volume does not increase at the same proportion as it does in a normotensive pregnancy which results in a relatively higher HGB concentration. (1) Therefore, it is not surprising that there is an association between adverse pregnancy outcomes and the increasing HGB levels. (9) Accordingly, higher than normal HGB concentrations should be regarded as an indicator of possible pregnancy complications, not necessarily as a sign of adequate iron nutrition because iron supplementation does not increase HGB higher than the optimal concentration needed for oxygen delivery. (9,10) In a number of studies, maternal HGB concentration and plasma haematocrit levels have been investigated as an early predictive test for preeclampsia. (1) In one study in primiparous, the frequency of subsequent of hypertension ranged from 7% at HGB values under 10.5 g/dl to 42% at HGB concentration over 14.5g/dl. (11) Therefore, the current study was undertaken to evaluate the relevance of routinely done maternal HGB in assessment of preeclampsia.

Patients and Methods:-

In a prospective cross-sectional study from January 2015 to March 2016, this study was conducted on 160 pregnant women at their 14th weeks of pregnancy attending Al Noman Hospital in Baghdad. After measuring the HGB level of the study subjects at the first trimester of pregnancy, the subjects were followed up to delivery and the presence of preeclampsia was the main outcome under study. The inclusion criteria were singleton pregnancy, lack of systemic diseases, including diabetes, chronic hypertension and cardiovascular disease, chronic renal disease, and hemoglobinopathies. Those under medication, smokers, had multiple pregnancies, hydrops fetails, or mole hydatidiform, were eliminated from the study. The study protocol was approved by the Ethics Committee and written informed consent was obtained from the participants after comprehensive explanation of the procedure involved. The study group HGB levels were compared between women who developed preeclampsia (80) and control groups (80). Comparisons were done by One-way ANOVA test using SPSS version 22 and statistical programs version 9.

Results:-

A total sample of 160 pregnant women was studied. The mean \pm SD age of these women was 26.2 ± 6.8 , ranged from 15 to 40 years. Maternal age, parity, and systolic blood pressure and diastolic blood for the preeclamptic and control groups are compared in Table 1. It was shown that the physical examination of systolic blood pressure and diastolic blood pressure between the two groups was statistically significant with a P value of <0.001 . Parity was also found to be statistically significant with a P value of <0.05 .

Table 1:- Characteristics of pregnant patients with and without preeclampsia.

Characteristic	Mean \pm SD		P value
	Preeclamptic group (n = 80)	Control group (n = 80)	
Age in years	27.2 ± 7.4	25.3 ± 6.1	0.037676
Parity	1.68 ± 1.2	1.35 ± 1.3	0.051341
Systolic BP in mmHg	149.7 ± 10.6	106.8 ± 7.7	< 0.0001
Diastolic BP in mmHg	103.2 ± 10.1	69.6 ± 14.4	< 0.0001

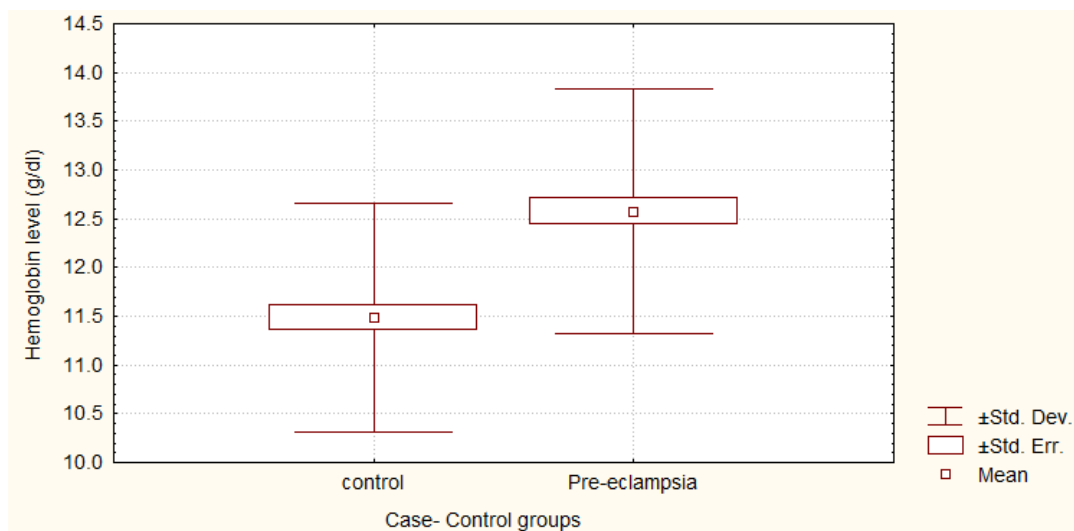
SD = standard deviation; BP = blood pressure. A P value of <0.05 was considered statistically significant.

Table 2:- Maternal Hemoglobin levels among preeclamptic and control women groups.

Cases and controls groups	Respondents' Hb level (g/ dl)		
	N	Mean \pm std. Error	Std. Deviation
Control	80	11.4863 \pm 0.13152	1.17632
Preeclampsia	80	12.5750 \pm 0.14028	1.25471

F= 32.058, df= (1, 158), P< 0.001

Routine HGB levels at 14th weeks' gestation for the preeclamptic and control groups are compared in Table 2. There was a significant relationship between HGB levels during the first trimester of pregnancy and preeclampsia. The mean HGB among preeclamptic women was 12.6 \pm 1.3 g/dL versus 11.5 \pm 1.2 g/dL in the control group with a P value of <0.001.

Graph 1:- Maternal Hemoglobin levels among preeclamptic women and control group.

Discussion:-

Preeclampsia is the third reason of death in pregnant women and early detection of this disease is important in diagnostic medical research. Thus, this study was performed to predict preeclampsia by evaluating the level of maternal HGB in the first trimester of pregnancy. Several studies showed that the risk assessment at level of antenatal care clinics can be considered as valuable prognostic tool for prediction of preeclampsia. (3) Moreover, effective screening tests for preeclampsia should be simple, safe, rapid, inexpensive and reproducible. They should also provide intervention opportunities to prevent the development of preeclampsia or, at a minimum, result in a better outcome. (1) The current study that investigates maternal HGB concentration was fulfilling these criteria.

Furthermore, epidemiologic studies have found a strong correlation between the prevalence of preeclampsia and plasma volume restriction and hematological disorders. (9,10) The association between adverse birth outcomes and high HGB concentrations observed in epidemiologic studies does not establish that high HGB concentrations are the direct cause of such adverse outcomes (evidence of risk only) is better explained by underlying causes of high HGB concentrations. (12)

The present study found that there was a statistically significant relation between high maternal HGB concentration in the first trimester of pregnancy and preeclampsia.

A variety of cross sectional studies have performed to investigate maternal HGB as a screening tool to examine the association between HGB and preeclampsia. In general, there appears to be an agreement that higher maternal HGB levels at different stages of pregnancy increase the risk of preeclampsia. (9) Azar Aghamohammadi et al. suggested that women with high HGB concentration in the first trimester carried an increased risk of pregnancy induced

hypertension. (12) Similarly, Malihe Nasiri et al. showed that the women with preeclampsia had a higher mean of HGB values and the difference was 0.46 g/dL ($P = 0.003$). The results of this study were similar to their findings and showed that the women with preeclampsia had a higher mean of HGB values. (3) However, Bahaeldin Hassan et al. showed that although there was an increase in laboratory blood tests of maternal HGB levels, it was failed to show any statistical significance. (1) In contrast to this study, Khoigani et al. conducted a study in the first and second half of the pregnancy separately. They concluded that Low levels of HGB during the first half of pregnancy was associated with preeclampsia ($p = 0.024$). (13) Older reports have also addressed the issue of low maternal HGB levels and preeclampsia and this was thought to be a reflection of low socio-economic and poor nutritional status in developing countries. (9) Other study done by Gearaldine Monteiro et al. showed that the HGB concentration and PCV did not differ significantly between normotensive and preeclamptic mothers with normal foetus. (6)

Conclusion:-

In conclusion, the hemoglobin test which is routinely done as a screening test for anaemia in early trimester of pregnancy may be useful as a screening test for early diagnosis of preeclampsia in health centers.

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