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SHORT COMMUNICATION

Maternal hematocrit status affecting pregnancy outcome

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Abstract

Low and high maternal hematocrit can influence outcome of pregnancy.Anemia is frequently observed during pregnancy. This study was performed to determine the maternal hematocrit status affecting pregnancy outcome in babol, northern Iran.

The present cohort control study was conducted from Dec 2001 to Dec 2002 and comprised 609 randomly selected pregnant women who attended Yahyanejad Hospital for antenatal care and delivery. Women with hemoglobinopathies such as thalassemia were excluded from the study. Maternal characteristics including hematocrit values were recorded at the first antenatal care visit when 3ml blood collected from each woman was sent to the laboratory for CBC. Anemia marked by hematocrit<34% in the first trimester was associated with a significantly increasing risk of low birth weight (<2500 g) and preterm delievery which was indicated by the gestational age of less than 37 weeks. High hematocrit values (>40%) did not increase the risk of low birth weight or preterm delivery. The risk of low Apgar score, operative deliveries and admittance to the newborn intensive care unit (NICU) were significantly increased in women with high and low hematocrit. Thus pregnant women with abnormal hematocrit are at high risk and due awareness is required of how to prevent complication and dismal outcome of pregnancies by special clinical care.

Keywords: Hematocrit; Anemia; Low birth weight; Preterm delivery; Pregnancy outcome

Introduction

Low and high maternal hematocrit can influence outcome of pregnancy.[1] Anemia is frequently observed during pregnancy.The prevalence of anemia among pregnant women is 55.9% worldwide and varies between 35 and 100% in developing countries.[2,3] The maternal death rate due to anemia is reported as 20% in Africa.[4] In addition, the abnormal hematocrit during pregnancy may lead to an increased risk of preterm delivery, intrauterine growth retardation, decreased physical working capacity, impaired immune function and cardiac failure.[5,6] Recent studies emphasized an association between high maternal hematocrit or hemoglobin values and adverse pregnancy outcome.[7,8] It has been suggested that a high blood viscosity may reduce the perfusion of the placental infarctions, which may lead to intrauterine growth restric-

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tion.[9] There are some controversial reports about the association between maternal hematocrit and adverse outcome of pregnancy. The aim of the present investigation was to determine the association between maternal hematocrit and the risk of adverse pregnancy outcome.

Materials and Methods

This study was performed on a cohort of 609 randomely selected pregnant women who referred to Yahyanejad Hospital in Babol for antenatal care and delivery from Dec, 2001 to Dec, 2002. The data collected were based on questionnaires, clinical examination and laboratory investigations. All the pregnant attended Yahyanejad Hospital for antenatal care routinely received iron and folate supplements. Women with diabetes mellitus, cardiovascular disease, chronic hypertension and diseases other than anemia, multiple pregnancies, and those who delivered infant with congenital malformations were excluded from the study. Blood samples (3 mL) were taken from all women for maternal hematocrit concentration; mean cell volume (MCV) and blood group identification upon the first trimester antenatal visit. Electrophoresis was carried out for those with MCV<80 fL, and their partners were also subjected to MCV screening. If both partners had low MCV, prenatal diagnosis was contemplated to determine whether or not the fetus was affected by homozygous thalassemia, a situation justifying pregnancy termination. Pregnancy outcome included birth weight, gestation at delivery, Apgar score, mode of delivery, admitted NICU and perinatal death. LBW was defined as a birth weight below 2500 g, preterm delivery as a gestational age of less than 37 weeks after the last menstrual period and low apgar score as a score less than 7 at one and five minute after delivery. The hematocrit values were estimated in a Micro-capillary reader, a method routinely used for evaluation of hematocrit in this hospital. Excluding 2 pregnancies because of thalassemia, severe and moderate (n=69) anemia represented hematocrit <25% and 25%-33.9%, respectively. Normal hematocrit was 34% to 40% (n=293) and high hematocrit represented >40% (n=247). The SPSS program packages were applied for data analyses. Statistical analyses were carried out with Chi-square, Fisher exact test and ANOVA and P<0.05 was considered as significant. Logistic regression analyses were used for the two binary dependent variables, LBW and preterm delivery.

Results

The pregnant women participating in this study aged from 15-43 (mean age 24.81±5.4), of which 25% were less than 20 years. The ANOVA test showed that the age distributions were the same in the three groups The majority of women (54.3%) were nulipara. 26.6% were para 1, 13.4% were para 2 and 5.4% were para 3 or more. The birth weight ranged from 1000 to 5000g (3288 ±515g) of which 87.4% weighed from 2500 to 4000g, 8.7% had LBW (<2500g) and 3.6% had macrosomia (> 4000 g).

The observed low hematocrit values were associated with increasing LBW (p<0.02). In multiple logistic regression analysis, the adjusted OR was 2.44 (1.11-5.35) but the high maternal hematocrit values (›40%) were not associated with a rising risk of LBW (Table 1). The majority of women (91.4%) had term delivery. The incidence of preterm and prolonged delivery were 6.6% and 2% respectively. The women with moderate anemia (hematocrit 25%-33.9%) had a significantly high risk of preterm infants compared to

Table 1: The association between maternal hematocrit values and low birth weight in 609 pregnant women, 2001-2002

Birth weight	Number (%) of patients with hematocrit of			Total n (%)
	25%-33.9%	34%-40%	>40%	
<2500 g	11 (15.9)	22 (7.2)	21 (8.5)	**54 (8.7)**
>2500 g	58 (84.1)	271 (92.8)	226 (91.5)	**555 (91.3)**
Total	**69 (100)**	**293 (100)**	**247 (100)**	**609 (100)**

those of the control group (p<0.003). In multiple logistic regression analyses, the adjusted OR was 3.9 (1.6-9.6), but high maternal hematocrit values higher than 40% were not associated with increasing risk of preterm delivery (Table 2). In this study, 45% of women underwent operative delivery including cesarean section or forceps delivery and vaccum extraction and 55% of the cases had vaginal delivery. The operative delivery in women with low and high hematocrit was more than those with normal hematocrit values (p<0.001). A low Apgar score, less than 7 at 1 and 5 minutes after delivery was observed in 2% and 1% of cases, respectively. Women with low (25-33.9%) as well as high (› 40%) hematocrit values had the highest proportions of infants with low Apgar score (p<0.001). The results obtained showed an association between admitted NICU and low or high hematocrit with p<0.003 for low and p<0.04) for high hematocrit group. In multiple logistic regression analyses, the adjusted OR were 7.46 (2.04-27.03) and 3.049 (0.966-9.84) respectively. In this study, we did not observe any significant associations between maternal hematocrit value and recorded prenatal mortality. Similarly, no significant associations were found among weight gain, parity, interpregnancy spacing, maternal and paternal education, history of abortion or still birth, previous low birth weight and rural and urban life in regard to the risk of adverse pregnancy.

Discussion

In the present study, we found a positive association between maternal hematocrit values and the mean birth weight of the infants. Low maternal hematocrit significantly increased the risk of LBW and preterm delivery. It also increased the risk of low apgar score and operative delivery. The findings in our study

Table 2: The association between maternal hematocrit values and preterm delivery in 609 pregnant women during 2001-2002

Gestational age	Number (%) of patients with hematocrit of			Total n (%)
	25%-33.9%	34%-40%	25%-33.9%	
<37week	10 (14.5)	12 (4.1)	18 (7.3)	**40 (6.6)**
>37week	59 (85.5)	281 (95.9)	229 (92.7)	**596 (93.4)**
Total	**69 (100)**	**293 (100)**	**247 (100)**	**609 (100)**

are in accordance with the results from several other studies showing associations between maternal anemia and adverse pregnancy outcome.[1,4,5-10]

A significantly lower mean birth weight in infants born to women with anemia was reported in another study.[11] Goldenberg et al. reported a significant association between low hematocrit (<34) and preterm delivery.[12] In a study reported from India, a significant association was found between hemoglobin values and low Apgar score.[13] However, in the study conducted by Jean Claud etal, maternal hematocrit was not found to be a useful predictor for preterm birth.[14] Blankson etal found that low maternal hematocrit (27%-33%) was not significantly associated with preterm delivery and growth restrictions.[7]

In recent years, there has been a stronger focus on the association between high maternal hematocrit values and adverse pregnancy outcome. In a study performed by Rusia et al.[13] the hematocrit values above 40% were also found to be associated with significantly increasing risk of preterm delivery and fetal growth restriction (OR>2). The results of this study were in conflict with those of present investigation which showed no association between high hematocrit values (>40%) and the high risk of LBW and preterm delivery or perinatal death. On the other hand, associations were found between the increasing risk of low Apgar score and admittance to NICU, All in all, the results were in agreement with the study conducted by Bondevic, *et al*.[1] Also in a study by Sconlon, *et al*., the risk of preterm birth was found to rise in women with low hemoglobin level, with the odds ratio (CI 95%) being 1.68 (1.29-2.21). High hemoglobin level was associated with SGA, but not preterm birth.[15] Mola et al., found a strong association between maternal low hematocrit and the frequency of still birth.[8] In this study, we did not find any significant associations between maternal hematocrit values and perinatal deaths. This could however, be due to the limited number of recorded perinatal deaths (n=10). In conclusion, maternal hematocrit <34%, was found to be significantly associated with increasing risk of LBV, with particular emphasis on strategies for improving nutritional status among young Iranian women during pregnancy.

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