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Correlation of Maternal Anemia During Pregnancy and Low Birth Weight Infant at Chonburi Hospital

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ABSTRACT

Objective: To examine the correlation between maternal anemia and low birth weight infant and other perinatal outcomes.

Materials and Methods: A retrospective 5,526 pregnant women was studied from Janury 1, 2004 to December 31, 2007 at Department of Obstetrics and Gynecology, Chonburi Hospital, Thailand. The study group consisted of 1,197 anemie pregnant women (hematocrit less than 33% in first antenatal care was gave birth at Chonburi Hospital) and the control group consisted of 4,329 non-anemie pregnant women (hematocrit $\geq$ 33% in first ANC were gave birth at Chonburi Hospital). Demographic and perinatal outcomes (included low birth weight at delivery, preterm delivery, Apgar score at 1 and 5 min, mode of delivery, and hospitalization) were collected and compared between the study and control groups. Data was analysed using descriptive statistics and presented as mean $\pm$ SD and percentage. Statistical significance was using the Chi-square test and Fisher's Exact test for differences in qualitative variables and the Student t-test for differences in continuous variables. 95% confidence interval (CI) were computed p-value less than 0.05 were considered statistically significant.

Results: The anemic pregnant women tended to be younger, lower body weight, late first antenatal care visit and have newborn large for gestational age. There was no correlation between maternal anemic status with low birth weight (9.4%, 11.1%; p = 0.245) and birth asphyxia (3.4%, 3.7%; p = 0.63) when compared with the control group. The anemic group had more sick newborn and fetal dead but the cesarean section, vacuum delivery and breech assisted delivery rate was lower than the control group (P<0.01).

Conclusion: No correlation was found between maternal anemia with low birth weight infant and birth asphyxia. Operative and assisted deliveries tended to be lower in the anemic pregnant women.

Keywords: maternal anemia, low birth weight infant

Anemia in pregnancy is a worldwide phenomenon particularly in developing countries. The relationship between maternal anemia and perinatal outcomes such as increased risk of low birth weight (LBW), preterm delivery, low APGAR score at 1 and 5 minute and perinatal death are not

clear.

Maternal anemia is one of the most common medical problems in Thailand and has varied in etiology and severity. Anemia during pregnancy at Chonburi Hospital, is defined as hematocrit (Hct) less than 33% according to criteria of Department of Public Prosecution,Thailand. Several researchers have reported an association between anemia in pregnancy and low birth weight (LBW), preterm birth, or both[1-7] and many limitations have complicated the interpretation of the results.

The objective of this study was to evaluate the effect of maternal anemia on low birth weight infant and other neonatal outcomes in women receiving fetal delivery at Chonburi hospital and management according to Clinical Practice Guideline (CPG) for Anemic pregnant women.

This study was designed to investigate not only the correlation between maternal anemia and low birth weight infant but also the effect of anemia on neonatal complications (preterm delivery and fetal asphyxia by Apgar score at 1 and 5 minute), route of delivery and fetal hospitalization (Sick new born (SNB) or Neonatal care unit admission (NICU))

Materials and Methods

This retrospective study was conducted at the Department of Obstetrics and Gynecology, Chonburi Hospital, Thailand. The study enrolled pregnant women who gave birth at Chonburi Hospital from Janury 1, 2004 to December 31, 2007. Women whose Hct was less than 33% at first antenatal care (ANC) was included into the study group and women whose Hct was 33% or more was included into the control group. The inclusion criteria consisted of pregnant women who was not private case and attended at least 4 times of ANC. Cases with anemia would be managed according to Clinical Practice Guideline (CPG) of Chonburi Hospital for Anemic pregnant women.

The exclusion criteria were 1) multiple pregnancies 2) placenta previa 3) abruptio placenta 4) pregnancy induced hypertension (PIH) 5) gestational diabetic mellitus (GDM) and 6) maternal medical complications. Written informed consents were obtained in all cases.

The study and the control groups were extracted from labor room computer datas. The research proposal was approved by Ethical Committee of Chonburi Hospital. There was 1,197 anemic and 4,329 non anemic pregnant women, while the calculating sample size formula consisted of 600 women in each group. Because of no difficultly collected study group (1,197) and controlled group (4,329) from the hospital's labor room data base to the study and no more expension and wageses, then we used all samples for analysed.

Maternal demographic data was collected; including hematocrit, maternal age, gravidity, gestational age at first ANC and at delivery and numbers of ANC were recorded. The primary outcome was low birth weight (LBW) infant (less than 2500 grams). The secondary outcomes evaluated were birth asphyxia (Apgar scores at 1 and 5 minutes < 7), route of delivery and hospitalization

Statistical analysis was undertaken using SPSS Data Analysis with Comprehensive Statistics Computer Software (SPSS version 15 for Microsoft Windows, SPSS Inc, Chicago, USA). Data was analysed using descriptive statistics and presented as mean $\pm$ SD and percentage. Statistical significance was evaluation using the Chi-square test and Fisher's Exact test for differences in qualitative variables and the Student t-test for differences in continuous variables. The 95% confidence interval (CI) were computed, p-value less than 0.05 were considered statistically significant.

Results

From Janury 1, 2004 to December 31, 2007, total of 5,526 women fulfilled criteria. Among these 1,197 were anemic and 4,329 were non-anemic. The incidence of maternal anemia during the study period therefore averaged 27%. Table 1 shows maternal demographic characteristics of the two groups. The mean of hematocrit at first ANC in the study group was 30.51 $\pm$ 1.80 percent (range 21 – 32.9 percent) and in the control group was 36.49 $\pm$ 2.45 years

(range 33 – 49 percent). Patients with anemia tended to be younger, had lower body mass index (BMI), lower blood pressure and late first ANC (mostly in second trimester). Both groups had similar mean gestational age at delivery, mean height and mean weight. Differences in parity and preterm delivery were not statistically significant

Table 2. shows neonatal complications between the two groups. Mean birth weight and mean APGAR score at 1 and 5 minute were not statistically significant difference among the two groups. There was no significant difference of LBW between two groups.

Table 3. classifies the route of delivery between two groups. The cesarean section rate, vacuum extraction rate and breech assisted delivery rate were lower in anemic group compared with control group ($p< 0.001$). The forceps extraction rate and normal vaginal delivery rate were significantly higher in the study group than control group.

Table 4. shows comparison of the fetal hospitalization between the two groups. The SNB and NICU admission rate between two groups were no significantly difference.

Table 1. Maternal demographic data

Characteristics	Anemic group (1,197 cases)	Non-anemic group (4,329 cases)	p-value
Maternal age* (years)	25.27±6.00	26.31±5.70	< 0.001
Gestational age at 1st ANC* (days)	144.05±44.91	130.08±48.53	< 0.001
1st trimester (1-98) (%)	184 (15.2)	1250 (28.9)	< 0.001
2nd trimester (99-196) (%)	883 (74.1)	2689 (62.2)	
3rd trimester (≥ 197) (%)	130 (10.7)	390 (8.9)	
Gestaional age at delivery* (days)	270.623±13.02	269.93±14.36	0.127
Preterm (196-258) (%)	181 (15.1)	662 (15.2)	0.223
Term (259-294) (%)	1007 (84.4)	3613 (83.8)	
Postterm (≥ 295) (%)	9 (0.5)	54 (1.0)	
Hematocrit* (%)	30.51±1.80	36.49±2.45	< 0.001
Body weight at 1st ANC* (kgs)	63.29±9.88	67.99±9.59	0.139
Height* (cms)	156.43±5.75	156.58±5.94	0.451
Body mass index* (kg/m^2)	25.84±3.78	27.04±4.19	<0.001
Systolic blood pressure* (mmHg)	120.62±9.98	122.14±10.15	<0.001
Diastolic blood pressure* (mmHg)	78.12±8.05	79.24±8.71	<0.001
Antenatal care visit*	7.98±2.40	8.73±2.48	<0.001
Parity* (%)	1.86±0.94	1.84±0.94	0.402
1	518 (43.3)	1874 (43.3)	0.332
2	406 (33.9)	1565 (36.1)	
≥ 3	273 (22.8)	890 (20.6)	

* Mean ± SD

p-value by Independent t-test compared between the study and the control groups.

Table 2. Neonatal outcomes

Neonatal Outcomes	Anemic group (1,197 cases) Number (%)	Non-anemic group (4,329 cases) Number (%)	p-value
Birth weight (mean ± SD; grams)	3048.32±450.12	3040.69±481.97	0.603
1000-2500 gms (LBW)	113 (9.4)	482 (11.1)	0.245
2500-4000gms(normal)	1064 (88.9)	3782 (87.4)	
> 4000 gms (LGA)	20 (1.7)	65 (1.5)	
Apgar score at 1 min (mean ± SD)	9.62±1.18	9.59±1.19	0.495
< 7	40 (3.3)	161 (3.7)	0.538
≥ 7	1157 (96.7)	4168 (96.3)	
Apgar score at 5 min (mean ± SD)	9.88±0.785	9.86±0.825	0.457
< 7	12 (1)	52 (1.2)	0.570
≥ 7	1185 (99)	4277 (98.8)	

p-value by Independent t-test and Chi-square test.

Table 3. Route of delivery

Route of delivery	Anemic group (1,197 cases) Number (%)	Non-anemic group (4,329 cases) Number (%)	p-value
Normal vaginal delivery	845 (70.4)	2768 (63.9)	< 0.001
Vacuum extraction	85 (7.2)	453 (10.5)	
Cesarean section	226 (18.9)	960 (22.2)	
Forceps extraction	36 (3)	111 (2.6)	
Breech assisted	3 (0.3)	27 (0.6)	
BBA(birth before admit)	2 (0.2)	10 (0.2)	

p-value by Chi-square test and Fisher's Exact test.

Table 4. Fetal hospitalization

Fetal hospitalization	Anemic group (1,197 cases) Number (%)	Non-anemic group (4,329 cases) Number (%)	p-value
Post partum unit (with mother)	1132 (94.6)	4050 (93.6)	0.185
Sick new born (SNB)	55 (4.6)	215 (5.0)	
Neonatal intensive care unit (NICU) admission	5 (0.4)	47 (1.0)	
Dead	5 (0.4)	17 (0.4)	

p-value by Chi-square test and Fisher's Exact test.

Discussion

In this study the incidence of anemic pregnant women was found to be 72 per 1,000 total births at Chonburi hospital. There was no increase in low birth weight and birth asphyxia in anemic group.

Where as the most published results of studies on maternal anemia and neonatal outcomes[2-8] showed that maternal anemia was increased low birth weight infants, preterm delivery and cesarean rate.

Anemia in pregnancy is defined by the World Health Organization as a hemoglobin value below 11 g/dl, but in this study we defined anemia is Hct value below 33% following the criteria of Department of Public Prosecution,Thailand. Mean Hct in the anemic group and control group was 30.51 $\pm$ 1.80% and 36.49 $\pm$ 2.45% ($p< 0.001$) respectively.

Maternal body weight was measured at first ANC which was no significant difference in both groups, but the control group tended to be overweight that may be poor controlled nutrition. Different in blood pressure may be several sample sizes because little difference make to significant difference. The control group tended to earlier ANC visiting than the study group and also higher number of ANC visiting.

Although significant difference in BMI, gestational age at 1st ANC and number of ANC visiting, there was no statistically significant difference in mean birth weight, low birth weight rate, mean Apgar score at 1 and 5 min and asphyxia rate among the two groups. In addition, LBW rate and other neonatal outcome were not depended on several factors as above. We cannot explain the significant difference of the route of delivery among the two groups. The causes may be from other factors which was not attributed from anemia.

Differences in SNB and NICU admission rate and preterm delivery were not statistically significant. Even if many textbooks and many published studies showed anemic pregnant women had more sequalae, such as LBW infant or growth retarded infant and preterm delivery, to her fetus than non anemic pregnant women.

We concluded that maternal anemia is not correlated with low birth weight from this study. There was no increase in LBW and admission rate SNB and NICU in anemic compared to non anemic pregnant women. May be mild degree of anemia in study group that is not show significant difference as much as severe anemia that showed in the other studies.[7,8,10] There is different from previous researches finding which found association between maternal anemia and low birth weight.

Further research should be performed in prospective study which classified varying degree of anemia and trimester of first visit to antenatal care unit to define the cause of low birth weight infant.

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ความสัมพันธ์ของภาวะโลหิตจางระหว่างตั้งครรภ์และการเกิดทารกน้ำหนักน้อยที่โรงพยาบาลชลบุรี

สุนารี พิชญ์ชัยประเสริฐ, ธีระ ศิวดุลย์

วัตถุประสงค์ *: เพื่อศึกษาความสัมพันธ์ของภาวะโลหิตจางระหว่างตั้งครรภ์และการเกิดทารกน้ำหนักน้อย และศึกษาเปรียบเทียบภาวะแทรกซ้อนของทารกระหว่างสตรีตั้งครรภ์ที่มีภาวะโลหิตจางและสตรีตั้งครรภ์ปกติ*

วัสดุและวิธีการ *: การศึกษาวิจัยแบบย้อนหลัง*

สถานที่ทำการวิจัย *: แผนกสูติ-นรีเวช โรงพยาบาลชลบุรี*

วิธีวิจัย *: ทำการศึกษาในสตรีตั้งครรภ์เดี่ยว สุขภาพดีไม่มีโรคประจำตัวใดๆ ฝากครรภ์ตั้งแต่ 4 ครั้งขึ้นไปและไม่ได้ฝากทำคลอดพิเศษที่มาคลอด ณ โรงพยาบาลชลบุรี ตั้งแต่ 1 มกราคม 2547 ถึง 31 ธันวาคม 2550 จำนวน 5,526 คนโดยกลุ่มศึกษาคือ สตรีตั้งครรภ์ที่มีภาวะโลหิตจางที่มีระดับความเข้มข้นฮีมาโทคริต น้อยกว่าร้อยละ 33 ตั้งแต่การฝากครรภ์ครั้งแรก โดยได้รับการดูแลตามแนวทางการดูแลรักษา (Protocal Clinical Practice Guideline) สตรีตั้งครรภ์โลหิตจางของโรงพยาบาลชลบุรีจำนวน 1,197 คน และกลุ่มเปรียบเทียบคือ สตรีตั้งครรภ์ที่ไม่มีภาวะโลหิตจางที่มีระดับความเข้มข้นฮีมาโทคริตก่อนคลอด ตั้งแต่ร้อยละ 33 ขึ้นไปตั้งแต่ฝากครรภ์ครั้งแรก ที่มาคลอดบุตรที่โรงพยาบาลชลบุรีในช่วงเวลาเดียวกันจำนวน 4,329 คน โดยศึกษาข้อมูลทั่วไปของสตรีตั้งครรภ์และเปรียบเทียบค่าเฉลี่ยน้ำหนักทารกแรกเกิดและอัตราการเกิดทารกน้ำหนักตัวน้อยกว่าปกติคือ ตั้งแต่ 1,000 กรัม ขึ้นไปแต่น้อยกว่า 2,500 กรัมรวมถึงภาวะแทรกซ้อนของทารกระหว่าง 2 กลุ่ม*

ผลการศึกษา *: สตรีตั้งครรภ์ที่มีภาวะโลหิตจางมีอายุน้อยกว่า น้ำหนักตัวน้อยกว่า และเริ่มฝากครรภ์ช้ากว่า สตรีตั้งครรภ์ที่ไม่มีโลหิตจาง โดยไม่พบอัตราทารกน้ำหนักน้อยกว่าปกติ การขาดออกซิเจนแรกคลอด การคลอดก่อนกำหนดและการนอนพักรักษาในแผนกเด็กป่วย เพิ่มขึ้นอย่างมีนัยสำคัญ ในสตรีตั้งครรภ์ที่มีโลหิตจางเปรียบเทียบกับสตรีตั้งครรภ์ปกติ นอกจากนี้ยังพบว่าภาวะซีดในสตรีตั้งครรภ์มีอัตราการผ่าตัดคลอด การคลอดโดยใช้เครื่องดูดสุญญากาศ และ การช่วยคลอดท่าก้นลดลงอย่างมีนัยสำคัญ ($p< 0.001$)*

สรุป *: ภาวะโลหิตจางระหว่างตั้งครรภ์ไม่มีความสัมพันธ์กับการเกิดทารกน้ำหนักตัวน้อย การขาดออกซิเจนแรกคลอด การคลอดก่อนกำหนด และการนอนพักรักษาในแผนกเด็กป่วย โดยพบอัตราการผ่าตัดคลอด การคลอดโดยใช้เครื่องดูดสุญญากาศ และการช่วยคลอดท่าก้นลดลงอย่างมีนัยสำคัญ*