The Prevalence and Causes of Anemia during Pregnancy in Maharaj Nakorn Chiang Mai Hospital

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Objective: *To determine the prevalence and causes of anemia during pregnancy in Maharaj Nakorn Chiang Mai Hospital.*

Material and Method: *The pregnant women were screened with hemoglobin, hematocrit, osmotic fragility test, hemoglobin E test and serology for hepatitis B, syphilis and HIV at first antenatal visit. In anemic cases, serum ferritin, serum iron/total iron binding capacity, or therapeutic trial with iron supplementation were performed to assess the iron status. The cases of abnormal thalassemia screening were followed by hemoglobin A2 level, PCR for alpha-1(SEA type) and hemoglobin electrophoresis. Additional tests were stool exam, stool occult blood and red blood cell indices. Anemia was defined as a hemoglobin level less than 11.0 g/dl in the first and third trimester or less than 10.5 g/dl in the second trimester of pregnancy. The data was presented as mean, standard deviation and percentage.*

Results: *Six hundred and forty eight pregnant women were recruited. The prevalence of anemia was 20.1 percent(128 cases). Classified in each trimester, the prevalence was 17.3%, 23.8% and 50.0% in the first, second and third trimester, respectively. Thalassemia carriers and diseases were detected in 56 from 102 anemic pregnant women (54.9%). Iron status was assessed in 58 cases and iron deficiency anemia was found in 25 cases (43.1%). Other causes of anemia were parasitic infection (8.7%) and anemia of chronic disease (2.7%). In 37 anemic pregnant women (33.0%), the causes of anemia were not found.*

Conclusion: *The prevalence of anemia in pregnant women who first attended at the antenatal clinic was 20.1%. The main causes of anemia were thalassemia carriers/diseases and iron deficiency anemia.*

Keywords: *Anemia, Pregnancy, Prevalence, Thalassemia, Iron-deficiency anemia*

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Anemia during pregnancy is a common problem. Most studies have demonstrated adverse effects of anemia to both pregnant women and their offsprings. Klebanoff et al[1], Lieberman et al[2,3] and Marti et al[4] demonstrated the association between maternal anemia and increased risk of preterm birth. Godfrey et al[5] suggested a correlation between maternal iron deficiency anemia and low birth weight infants. Barbin et al[6] found a strong association between severe anemia and maternal mortality.

The prevalence of anemia among Thai pregnant women varied from 5.9-31.0 percent[7-10]. The prevalence of anemia has changed from the past which may be due to the decline of iron deficiency anemia from adequate dietary intake and nutritional supplements.

In Northern part of Thailand there is a special consideration. The prevalence of thalassemia carriers and diseases in this region is so high[11-14]. Therefore, there are high numbers of couples at risk for having severe thalassemia syndrome fetuses. The prospective thalassemia screening program has been used in Maharaj Nakorn Chiang Mai Hospital since 1994[15,16]. Wanapirak et al[14] has reported the overall prevalence of thalassemia traits was 25.4 percent and 5.6 percent of cases had anemia (defined as hemoglobin level < 10 g/dl).

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In Thailand, there are national policies to prevent and treat anemia during pregnancy such as iron supplementation and thalassemia screening program. However, the true prevalence and causes of anemia in most part of Thailand were not well defined. The authors aimed to study the prevalence and causes of anemia during pregnancy and hoped that the result might help to find cost-effective ways to investigate the pregnant women with anemia under limited resources.

Material and Method

The pregnant women who first attended the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, from October 1, 2005 to March 31, 2006 were recruited in this study.

The exclusion criteria were multiple pregnancies, pregnant women who had previously attended the antenatal clinic of another health services and whose blood specimen was not collected.

At the first antenatal visit, blood was collected and obtained for hemoglobin/hematocrit level, human immunodeficiency virus (anti HIV), hepatitis B surface antigen (HBs Ag), serology for syphilis (VDRL), osmotic fragility test (OFT) and hemoglobin E test. In cases of anemia, blood for red blood cells indices, serum ferritin, serum iron/total iron binding capacity and stool exam and stool occult blood were performed depend on doctors and patients consideration, patients' economic status was concerned.

In cases whose serum ferritin was not performed, therapeutic trial[17] with 200 mg elemental iron 3 times a day and follow up hemoglobin/hematocrit level after 4-6 weeks of treatment was performed.

Cases of abnormal thalassemia screening (OFT and Hb E test) were followed by hemoglobin A2 level and polymerase chain reaction (PCR) for diagnosis of alpha thalassemia 1 (SEA type) and/or hemoglobin electrophoresis from the same blood specimens.

Based on the Center for Disease Control and Prevention (CDC) criteria[18], anemia was defined as hemoglobin level less than 11 g/dl in the first and third trimester and less than 10.5 g/dl in second trimester. Iron deficiency anemia was defined as serum ferritin less than 30 µg/L (19) or SI/TIBC less than 16% or hemoglobin level rising more than 1 g/dl after 4-6 weeks of therapeutic trial.

The data was presented as mean, standard deviation, and percentage.

Results

From October 1, 2005 to March 31, 2006 there were 823 pregnant women attended the antenatal clinic of Maharaj Nakorn Chiang Mai Hospital. Six hundred and thirty eight pregnant women were recruited. The number of pregnant women who first attended the antenatal clinic during the first, second and third trimester were 452,164 and 22 cases, respectively. The mean age was 27.1 ± 6.1 years (range 13-51 years). There were 389 (61.0%) nulliparous and 249 cases (39.0%) had one child or more.

The mean hemoglobin level was 11.6 ± 1.1g/dl (range 7.8-14.5 g/dl). The prevalence of anemia during pregnancy was found to be 20.1%. Categorized by trimester, the prevalence of anemia was shown in Table 1.

Among 128 anemic pregnant women, 16 cases were loss to follow up, 112 cases remained for investigated to find out causes of anemia. Thalassemia screening was performed in all 112 cases, 10 cases were positive screening tests but% Hb A2, PCR for alpha thal 1 (SEA type) and hemoglobin electrophoresis were not performed. Thalassemia carriers and diseases were found in 56 of 102 cases (54.9%). Alpha-thalassemia trait (SEA type) was found in 17 cases (16.7%), beta thalassemia trait in 17 cases (16.7%), and hemoglobin E trait 12 cases (11.8%). The overall anemic pregnant women with thalassemia carriers/diseases were shown in Table 2.

Iron status was assessed in 58 of 112 cases (51.8%). Iron deficiency anemia was diagnosed in 25 cases (43.1%). Serum ferritin was assessed in 16 cases, and 7 cases (43.8%) were found to have serum ferritin below 30 µg/l. SI/TIBC and therapeutic trial of iron supplement were performed in 25 and 21 cases, respec-

Table 1. The prevalence of anemia in each trimester

Trimester	No. of pregnant women (cases)	No. of anemic mothers (cases)	Prevalence (%)
First	452	78	17.3
Second	164	39	23.8
Third	22	11	50.0
Total	638	128	20.1

Table 2. Causes of anemia during pregnancy

Causes of anemia	Cases/performed tests	Percentage
Thalassemia	56/102	54.9
Alpha trait	17	16.7
Hb H	8	7.8
Beta trait	17	16.7
Hb E trait	12	11.8
Beta thal/Hb E disease	1	1.0
Compound alpha/Hb E trait	1	1.0
Iron deficiency anemia	25/58	43.1
Anemia of chronic disease	3/112	2.7
Parasitic infection	2/23	8.7
No identified causes	37/112	33.0

tively. Eight cases were diagnosed iron deficiency anemia by mean of abnormal SI/TIBC and10 cases were diagnosed by therapeutic trial with iron supplement and hemoglobin level rising more than 1 g/dl in 4-6 weeks.

In this study, 27 cases available for red blood cell indices and megaloblastic anemia were not found. The stool for parasites was positive in two of 23 cases. In three cases, anemia was resulted from underlying disease of anemic pregnant women (Lupus nephritis, chronic pancreatitis and chronic ITP in each case). The overall causes of anemia are shown in Table 2.

Discussion

The prevalence of anemia during pregnancy in this study was 20.1%. Compared with 5.6% from previous study at Maharaj Nakorn Chiangmai Hospital by Wanapirak et al[14], the prevalence of anemia in this study seemed to be higher. However, if used the same hemoglobin cut-off level of 10 g/dl, the prevalence from this study would be 8.3%, which was not much different from the previous study.

By trimester, the highest prevalence in this study was detected in third trimester. This finding similar to other studies[10] found women at late antenatal visit were at risk for anemia during pregnancy.

The main causes of anemia during pregnancy in this study were thalassemia carriers/diseases (54.9%) and iron deficiency anemia (43.1%), similar to the study by Chotnopparatpattara et al at King Chulalongkorn Memorial Hospital. They reported that anemia in pregnant women was associated with abnormal pattern of hemoglobin electrophoresis in 41.6%, and associated with iron deficiency anemia in 19.9%. The prevalence of iron deficiency anemia in this study was higher compared to their study. This may be due to the fact that different diagnostic criteria were used, which defined iron deficiency anemia as serum ferritin less than 12 µg/dl while we used the criteria mentioned above.

Thalassemia screening was performed in all 112 cases, 10 cases were positive screening tests but%Hb A2, PCR for alpha thal 1 (SEA type) and hemoglobin electrophoresis were not performed because of normal screening results in their partners suggested that they were not couple at risk for severe thalassemia syndrome fetuses.

In this study, iron status was assessed in 58 cases (51.8%). Serum ferritin was performed in only 16 cases because of economic problem of the pregnant women and seven cases (43.8%) were found to have serum ferritin below 30 µg/l. Therapeutic trial with iron supplement was performed in 21 cases and 10 cases (47.6%) were diagnosed iron deficiency anemia. This finding suggested that in limited resource diagnosis of iron deficiency anemia could be performed by therapeutic trial. In cases in which iron status was not assessed may be due to mild anemia (hemoglobin level above 10 g/dl) or by prior identified cause such as thalassemia carriers/diseases.

Not all anemic pregnant women in this study received full investigation. The other causes of anemia were diagnosed as described in Table 2. In the 37 cases where the causes of anemia were not identified, 25 cases were not assessed for iron status and eight cases were positive thalassemia screening but were not perfomed with further investigation for the reasons discussed above.

In conclusion, anemia was found in 20.1% of pregnant women who first attended the antenatal clinic at Maharaj Nakorn Chiangmai Hospital during the study

period. The prevalence of anemia during pregnancy in Chiang Mai did not change so much from the past if we use the same diagnostic criteria[14]. The main causes of anemia were thalassemia carriers/diseases and iron deficiency anemia. Future prospective study with research funds to support the cost of investigations is needed to provide more accuracy in identifying the causes of anemia. The value of therapeutic trial compared with serum ferririn in diagnosis of iron deficiency anemia in low-resource hospital should be investigated.

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ความชุกและสาเหตุของภาวะโลหิตจางในสตรีตั้งครรภ์ในโรงพยาบาลมหาราชนครเชียงใหม่

บุญฤทธิ์ สุขรัตน์, สุพัตรา ศิริโชติยะกุล

วัตถุประสงค์: *เพื่อศึกษาความชุกและสาเหตุของภาวะโลหิตจางในหญิงตั้งครรภ์*

สถานที่ทำการศึกษา: *คลินิกฝากครรภ์ ภาควิชาสูติศาสตร์-นรีเวชวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ โรงพยาบาลมหาราชนครเชียงใหม่*

รูปแบบการวิจัย: *การศึกษาเชิงพรรณนา (แบบไปข้างหน้า)*

วัสดุและวิธีการ: *สตรีตั้งครรภ์ที่มาฝากครรภ์เป็นครั้งแรกทุกรายได้รับการเจาะเลือดตรวจ hemoglobin, hematocrit, OFT, Hb E test ตรวจหาเชื้อซิฟิลิส ตรวจหาเชื้อไวรัสตับอักเสบ บี และตรวจ anti HIV ในสตรีตั้งครรภ์ที่พบภาวะโลหิตจาง จะได้รับการตรวจ serum ferritin หรือ SI/TIBC หรือได้รับการทดลองให้การรักษาด้วยธาตุเหล็ก เพื่อประเมินว่ามีภาวะขาดธาตุเหล็กหรือไม่ ในรายที่การตรวจคัดกรองธาลัสซีเมียให้ผลผิดปกติจะได้รับการตรวจ Hb A2, PCR for alpha-1(SEA type) และ hemoglobin electrophoresis เพิ่มเติม การตรวจเพิ่มเติมอื่น ๆ ได้แก่ การตรวจอุจจาระหาพยาธิ และ occult blood, การตรวจ RBC indices จะให้การวินิจฉัยภาวะโลหิตจางระหว่างตั้งครรภ์ เมื่อตรวจพบระดับฮีโมโกลบินน้อยกว่า 11 กรัมต่อเดซิลิตร ในไตรมาสที่หนึ่งและสาม หรือตรวจพบระดับฮีโมโกลบินน้อยกว่า 10.5 กรัมต่อเดซิลิตรในไตรมาสที่สอง โดยนำเสนอในรูปแบบของ ค่าเฉลี่ย, ส่วนเบี่ยงเบนมาตรฐาน และร้อยละ*

ผลการศึกษา: *สตรีตั้งครรภ์จำนวน 648 ราย ตรวจพบภาวะโลหิตจาง 128 ราย คิดเป็นความชุกได้ร้อยละ 20.1 แบ่งเป็นความชุกในไตรมาสที่หนึ่ง, สอง และสามได้เท่ากับ ร้อยละ 17.3, 23.8 และ 50.0 ตามลำดับ ตรวจพบพาหะหรือโรคธาลัสซีเมียในสตรีตั้งครรภ์ 56 จาก 102 ราย คิดเป็นร้อยละ 54.9 ตรวจพบภาวะโลหิตจางจากการขาดธาตุ เหล็ก 25 จาก 58 ราย คิดเป็นร้อยละ 43.1 สาเหตุอื่น ๆ ที่ตรวจพบได้แก่ การตรวจพบเชื้อพยาธิในอุจจาระร้อยละ 8.7 ภาวะซีดจากโรคเรื้อรังของสตรีตั้งครรภ์ร้อยละ 2.7 มีสตรีตั้งครรภ์ 37 ราย (ร้อยละ 33.0) ตรวจไม่พบสาเหตุของ ภาวะซีดระหว่างตั้งครรภ์*

สรุป: *ภาวะโลหิตจางในสตรีตั้งครรภ์ที่มาฝากครรภ์ที่โรงพยาบาลมหาราชนครเชียงใหม่ มีความชุกร้อยละ 20.1 สาเหตุหลักคือเป็นพาหะหรือโรคธาลัสซีเมีย และภาวะโลหิตจางจากการขาดธาตุเหล็ก*