

## ORIGINAL ARTICLE

# IRON DEFICIENCY ANEMIA DURING PREGNANCY IN THE LOWER NORTH OF THAILAND- PREVALENCE AND ASSOCIATED FACTORS

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## ABSTRACT

This study was to evaluate the prevalence of iron deficiency anemia and the associated factors of anemia during pregnancy in the lower north of Thailand. A prospective study was conducted in pregnant women who attended the antenatal care clinic at Naresuan University hospital, Phitsanulok, from May 2008 - May 2010. All subjects were from the lower northern region of Thailand. A complete blood count and serum ferritin was performed in every case. Anemia during pregnancy was defined according to World Health Organization criterion as the hemoglobin less than 11 g/dL. Iron deficiency anemia was the anemia with a serum ferritin of less than 15 µg/L. Four hundred and one pregnant women were recruited for the study. Teenage pregnancy was 27%. The gestational age at the first visit ranged from 5 to 38 weeks and the iron supplement was found in 30% of cases. Anemia was found in 70 cases (17.5%). Twenty-four cases (6.0% of 401) had iron deficiency anemia but 61 cases were at the stage of iron deficient erythropoiesis without anemia. Associated factor for iron deficiency anemia was gestational age. This study confirmed a high prevalence of anemia and iron deficiency anemia. High proportion of pregnancies with iron deficient erythropoiesis was warranted.

**Key words:** Anemia, gestational age, iron deficiency anemia, pregnancy, serum ferritin.

## INTRODUCTION

Anemia during pregnancy is an important health issue in many countries. It can lead to miscarriages, fetal death in utero, fetal growth restrictions, and premature labor<sup>1-4</sup>. It is possible for such complications to result in both maternal or fetal morbidity and mortality. The four most common etiologies of anemia during pregnancy are iron deficiency, acute blood loss, infection and thalassemia<sup>5</sup>. For Thailand, the main etiologies of anemia during pregnancy are iron deficiency and thalassemia<sup>6-8</sup>.

Iron deficiency anemia is a major nutritional problem in many parts of the world. Those who are most at risk are infants, pre-school children, and pregnant women<sup>9-10</sup>. According to the Thailand National Nutritional Survey, the prevalence of anemia during pregnancy has declined substantially from around 40% to less than 20% since the 1990s<sup>11</sup>. Universal iron supplementation in pregnant women has shown to be effective in Thailand<sup>11</sup>. However, many recent studies still reveal a high percentage of iron deficiency anemia during pregnancy, ranging from 19.9% to 41.3%<sup>6,8,12</sup> of the anemia in pregnancy. The aim of the present study is to investigate the prevalence and associated factors of anemia and of iron deficiency anemia in

pregnant women living in the lower north of Thailand. This data could be beneficial for developing strategies to improve antenatal care for pregnancies in this area.

## MATERIALS AND METHODS

A prospective study of pregnant women was conducted. This study targeted subjects making their visit to the antenatal care clinic at Naresuan University Hospital, Phitsanulok, from May 2008 - May 2010. The subjects came from 7 provinces (Phitsanulok, Phetchabun, Phichit, Sukhothai, Tak, Kamphaeng Phet, and Uttaradit) of the lower north region of Thailand. Written informed consent was obtained from every subject before entering the study as approved by the Naresuan University Research Ethics Committee. A trained nurse recorded patient's pregnancy history only at the time when the blood for serum ferritin was taken for this study.

Blood for complete blood count (CBC) and ferritin was collected from each subject. The CBC and serum ferritin were performed by using CELL-DYN 3700<sup>TM</sup> (Abbott Laboratories, IL, USA) and AxSYM<sup>TM</sup> (Abbott Laboratories, IL, USA), respectively.

Based on World Health Organization (WHO) criterion, anemia during pregnancy was defined as the level of hemoglobin (Hb) that is less than 11 g/dL<sup>13</sup>. Iron deficiency anemia is the anemia with serum ferritin less than 15 µg/L<sup>14, 15</sup>. Iron deficient erythropoiesis is an earlier stage detected before iron deficiency anemia. This stage is defined as the level of serum ferritin less than 15 µg/L but without anemia<sup>14,15</sup>.

The data was presented as mean, standard deviation, median, and percentage. The logistic regression models were analyzed to explain the associated factors of anemia.

## RESULTS

Four hundred and one pregnant women were recruited in this study. The mean age was 26.1

years (standard deviation 7.0 years), with 27% of cases were teenager (see table 1). The mean gestational age at their first visit was 15.8 weeks (standard deviation 9.8 weeks). Two-thirds of cases had lower than university education and 30% had iron supplement for pregnancy. The mean Hb value was 11.9 g/dL (standard deviation 1.1 g/dL). The median serum ferritin level was 39.51 µg/L (Range 1.98 - 310.13 µg/L).

There were seventy women (17.5%) who had less than 11 g/dL of Hb. Of these, 24 had less than 11 g/dL of Hb and a serum ferritin level less than 15 µg/L (or 6% of 401 cases were classified as iron deficiency anemia). Eight of the twenty-four iron deficiency anemia cases (33.3%) were younger than 20 years old. Eighty-five cases (21.2% of 401 cases) had serum ferritin less than 15 µg/L, or 61 cases (72% of 85 cases) were at the stage of iron deficient erythropoiesis without anemia.

**Table 1. Baseline characteristics of pregnant women attending antenatal clinic (n=401)**

Characteristics	n	%
Age (year)		
Less than 20	109	27.2
20-34	239	59.6
35 or more	53	13.2
Mean (SD)	26.1	(7.0)
Education levels*		
Low	52	14.4
Moderate	186	51.7
High	122	33.9
Gravida		
1 or less	210	52.4
More than 1	191	47.6
Parity		
1 or less	364	90.7
More than 1	37	9.3
GA at First ANC (weeks)		
12 or less	214	53.7
13-20	70	17.6
21- 28	37	9.3
29 or more	77	19.4
Mean (SD)	15.8	(9.8)
Fe supplement		
Yes	280	70.2
No	119	29.8

\*Low education level = no education to primary school, Moderate= college/high school, High=university/postgrad

Univariate and multivariate analyses to identify associated factor of iron deficiency anemia in tables 2 and 3 confirmed that gestational age was the associated factor of iron deficiency anemia.

The later the first antenatal visit, the higher the risk (odds ratio 4.2, 95% CI 1.3-16.3 for 13 to 27 weeks; and odds ratio 4.7, 95% CI 1.2-17.8 for 28 weeks and more).

**Table 2. Risk factors of pregnant women diagnosed with iron deficiency anemia**

Risks	Iron deficiency anemia		P value
	Yes n (%)	No n (%)	
Maternal age			0.15
Less than 20 yrs.	10 (9.2)	99 (90.8)	
20 or more	14 (4.8)	278 (95.2)	
Gravida			0.53
0-1	11 (5.8)	178 (94.2)	
2 or more	13 (6.1)	199 (93.9)	
Parity			0.47
0-1	21 (5.8)	343 (94.2)	
2 or more	3 (8.1)	34 (91.9)	
Gestational age (weeks)*			0.02
5- 12	5 (2.3)	209 (97.7)	
13-27	10 (9.9)	91 (90.1)	
28-38	9 (10.8)	74 (89.2)	
Education			0.14
Low	11 (7.2)	141 (92.8)	
Moderate to high	7 (3.4)	201 (96.6)	
Iron supplement			0.10
Yes	13 (4.6)	267 (95.4)	
No	11 (9.2)	108 (90.8)	

\*Gestational age was recorded at first antenatal visit at Naresuan University Hospital

**Table 3: Multivariate analysis of factors associated with iron deficiency anemia pregnant women**

Risks	Adjusted OR	95% CI	P-value
Maternal age (<20 years vs. 20+)	1.41	0.45-4.40	0.71
Gravida (>1 vs. 1 or less)	1.44	0.50-4.14	0.49
GA (13-27 wks vs. 12 or less)	4.17	1.31-16.30	0.01
GA (28-38 wks vs. 12 or less)	4.69	1.24-17.75	0.02
Low education vs. mod. to high	1.68	0.58-4.84	0.33

## DISCUSSION

In the present study, the prevalence of anemia during pregnancy was 17.5%. This number is reasonably close to the numbers from previous studies, which were 20.1% and 22.1% of pregnant women in the north region<sup>7-8</sup>, 23.5% in the northeast<sup>16</sup>, and 19.2 % in the central region of Thailand<sup>6</sup>. This data reveals that anemia during pregnancy in different regions of Thailand seems consistent, and the prevalence has declined literally according to the Thailand National Nutritional Survey<sup>11</sup>. However, about one-third of anemia was caused by iron deficiency (24 of 70 cases). In concordance with recent studies<sup>6,8,12</sup>, this implies that iron deficiency should still be of great concern when dealing with anemia during pregnancy. Unfortunately, the present study did not focus on specific diagnosis of thalassemia, another major cause of anemia in the pregnancy. The prevalence of carrier by routine screening of Thalassemia of the samples in the present study was not higher than the national average.

Despite declining prevalence in the anemia during pregnancy since the 1990s, there remains a significant number of iron deficiency anemia. The prevalence of iron deficiency anemia in the present study was 6.0%, consistent with other parts of Thailand: 4.9% in the north<sup>8</sup> and 6.0% in the central region<sup>12</sup>. Moreover, 15.2% of pregnancies (61 of 401 cases) in the present study had iron deficient erythropoiesis. This means that without iron supplement for this subgroup, iron deficiency anemia will be possibly detected in the future. With this regional data, a universal iron supplementation in pregnant women is still in need.

According to previous studies, the highest prevalence of anemia was found in teenage pregnancies<sup>17-20</sup>. In the present study, one third of iron deficiency anemia was found in teenage mothers but was not a significant associated factor possibly because of a small sample size. The rate of iron deficient erythropoiesis was high in the present study but the rate of iron supplement was low because 54% of the cases were under the first trimester. However, low rate of iron supplement may suggest that a high rate of iron deficiency anemia would be more prevalent if iron supplement had not been given at subsequent antenatal visits. Clinicians who take care of pregnancies should pay special attention to these factors.

## CONCLUSION

In conclusion, though anemia during pregnancy has substantially declined to less than 20%, iron deficiency still accounts for one-third of anemia in pregnant women in the lower north of Thailand. Seventy two percent of pregnancies with iron deficient erythropoiesis were found. Follow up study should be designed to reveal the effects of gestational age, iron supplement and serum ferritin with anemia in pregnancy and outcome.

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