

# The prevalence of anemia in pregnant women attending the prenatal clinic at King Chulalongkorn Memorial Hospital

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- Objective** : *To study the prevalence of anemia in pregnant women.*
- Setting** : *Prenatal Clinic, Department of Obstetrics and Gynecology, Faculty of Medicine, Chulalongkorn University, King Chulalongkorn Memorial Hospital.*
- Subjects** : *The pregnant women who first attended the prenatal clinic.*
- Design** : *Descriptive study (prospective method).*
- Material and Methods** : *The pregnant women were screened with a complete blood count and hemoglobin electrophoresis. In the case of anemia, serum iron and ferritin were investigated. Anemia was defined when hemoglobin level was less than 11.0 g/dL in the first and third trimester of pregnancy or less than 10.5 g/dL in the second trimester of pregnancy. The data was presented as mean, standard deviation and percentage.*

- Results** : *In total, 1,304 pregnant women were recruited. The number of pregnant women who first attended the prenatal clinic during their first, second and third trimester were 609, 594 and 101 cases, respectively. The prevalence of anemia was 19.2 % (251 cases). Classified in each trimester, the prevalence was 14.8 %, 20.5 % and 38.6 % in the first, second and third trimester, respectively. One hundred and sixty-one cases of anemia were available for serum iron and ferritin levels. Iron deficiency anemia, by means of serum ferritin lower than 12  $\mu\text{g/L}$ , was detected in 32 cases (19.9%). Those with serum iron lower than 60  $\mu\text{g/dL}$  were detected in 31 cases (19.3 %). The abnormal pattern of hemoglobin electrophoresis was detected in 367 cases (28.1 %).*
- Conclusion** : *The prevalence of anemia in pregnant women who first attended the prenatal clinic at King Chulalongkorn Memorial Hospital was 19.2 %.*
- Keywords** : *Anemia, Pregnancy, Prevalence.*

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- วัตถุประสงค์** : เพื่อศึกษาความชุกของภาวะโลหิตจางในสตรีตั้งครรภ์
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- ผู้ป่วยที่ได้ทำการศึกษา** : สตรีตั้งครรภ์ที่มาฝากครรภ์เป็นครั้งแรก
- รูปแบบการวิจัย** : การศึกษาเชิงพรรณนา (แบบไปข้างหน้า)
- วิธีการศึกษา-วัดผล** : สตรีตั้งครรภ์ทุกรายได้รับการเจาะเลือดตรวจ complete blood count, hemoglobin electrophoresis ในสตรีตั้งครรภ์ที่พบภาวะโลหิตจาง จะได้รับการตรวจระดับธาตุเหล็กและระดับ ferritin ในกระแสเลือด การวินิจฉัยโลหิตจางกำหนดไว้ดังนี้ ค่าฮีโมโกลบินน้อยกว่า 11 กรัมต่อเดซิลิตร ในไตรมาสหนึ่งและสาม หรือค่าน้อยกว่า 10.5 กรัมต่อเดซิลิตร ในไตรมาสสอง นำเสนอข้อมูลเป็นค่ามัธยฐานเลขคณิต ค่าเบี่ยงเบนมาตรฐาน และร้อยละ
- ผลการศึกษา** : สตรีตั้งครรภ์จำนวน 1,304 ราย มาฝากครรภ์ครั้งแรกในช่วงไตรมาสหนึ่ง จำนวน 609 ราย ไตรมาสสองจำนวน 594 ราย ไตรมาสสามจำนวน 101 ราย มีภาวะโลหิตจาง 251 ราย คิดเป็นความชุกได้ร้อยละ 19.2 แบ่งเป็นความชุกในไตรมาสหนึ่ง สอง สาม เท่ากับ ร้อยละ 14.8, 20.5, 38.6 ตามลำดับ ในจำนวนนี้ได้ตรวจระดับธาตุเหล็ก และระดับ ferritin ในกระแสเลือด 161 ราย พบสตรีตั้งครรภ์มีระดับ ferritin ต่ำกว่า 12 ไมโครกรัมต่อลิตร จำนวน 32 ราย (ร้อยละ 19.9) และพบระดับธาตุเหล็กในกระแสเลือดต่ำกว่า 60 ไมโครกรัมต่อเดซิลิตร จำนวน 31 ราย (ร้อยละ 19.3) เมื่อตรวจ hemoglobin electrophoresis พบลักษณะที่ผิดปกติ จำนวน 367 ราย (ร้อยละ 28.1)
- สรุป** : ภาวะโลหิตจางในสตรีตั้งครรภ์ที่มาฝากครรภ์ที่โรงพยาบาลจุฬาลงกรณ์ มีความชุกร้อยละ 19.2
- คำสำคัญ** : ภาวะโลหิตจาง, การตั้งครรภ์, ความชุก

Anemia is a common problem during pregnancy especially in less developed and developing countries. Most studies have demonstrated that pregnant women with anemia have adverse effects on their offspring.<sup>(1-3)</sup> Godfrey and colleagues suggested a correlation between maternal iron-deficiency anemia and low birth weight infants.<sup>(4)</sup> Klebanoff and coworkers found a slightly increased risk of preterm birth with mid-trimester anemia.<sup>(5)</sup> Furthermore, Viteri demonstrated that anemia was responsible for 40 percent of maternal deaths in developing countries.<sup>(6)</sup>

In Thailand, several reports involving anemia in pregnancy have been performed.<sup>(7-12)</sup> The prevalence of anemia in pregnant women varied from 4.1 to 36.7 percent and most of them were conducted many years ago. Recently, iron supplements during pregnancy have been widely used in Thailand. The prevalence of anemia in pregnancy might have changed since those past reports were conducted.

The most common cause of anemia in Thailand has been iron deficiency anemia especially during pregnancy. The iron requirements of pregnancy should always be considered. If the iron consumption is depleted, the stored iron will decrease and eventually, iron deficiency anemia may develop.

Other common causes of anemia in Thailand are thalassemia and hemoglobinopathy. These genetically transmitted diseases need medical advice and genetic counseling to detect a severe form of this disease in fetuses such as Bart's *hydrops fetalis*, in order to prevent maternal complication and to prepare parents for their next offspring. To evaluate the extent of this problem, we aim to study the prevalence of anemia including iron-deficiency anemia

and thalassemia during pregnancy.

## Materials and Methods

Pregnant women who first attended the prenatal clinic at King Chulalongkorn Memorial Hospital, Bangkok, from November 1, 1995 to January 31, 1996, were recruited for this study.

The exclusion criterion was pregnant women who previously attended the prenatal clinic or who came from other health care centers.

At their first prenatal visit, blood was collected and obtained for complete blood count and hemoglobin electrophoresis. In case of anemia, blood tests for serum iron and ferritin were performed. Anemic mothers were treated with 200 mg elemental iron per day until delivery.

The subsequent visitation guideline was followed for prenatal care: every 4 weeks until 28 weeks gestation, every 2 weeks during 28 - 36 weeks gestation and subsequently, every week until delivery.

Based on the Centers for Diseases Control (CDC) criteria, anemia is defined when hemoglobin is less than 11 g/dL in the first and third trimester and less than 10.5 g/dL in the second trimester.<sup>(13)</sup> Iron deficiency is defined when serum ferritin is lower than 12 µg/L.

The data were presented as descriptive statistics. The SPSS for Windows Statistical Package Program (release 10.0, SPSS Inc., Chicago, IL, U.S.A.) was used to analyze the result.

## Results

In total, 1,304 pregnant women were recruited in this study. The number of pregnant women who first attended the prenatal clinic during the first,

second and third trimester were 609, 594 and 101 cases, respectively. The baseline characteristics were shown in table 1. The mean age was  $25 \pm 5.5$  years (ranged 13-44 years). The majority of cases (56.2 %) were nulliparous. Thirty-three percent of women had one child. The remaining had two or more children.

The mean of hemoglobin was  $11.6 \pm 1.2$  g/dL (ranged 5.9 -15.6 g/dL). The mean of hematocrit was  $34.3 \pm 3.4$  % (ranged 17.6 – 43.2 %).

The prevalence of anemia categorized by the trimester was demonstrated in Table 2. The overall prevalence of anemia in this study was 19.2 %, which is highest in the third trimester. Among 251 anemic

mothers, 161 cases were available for serum iron and serum ferritin levels (Table 3). The levels of serum iron and serum ferritin were  $98.1 \pm 47.4$   $\mu$ g/dL and  $77.5 \pm 128.4$   $\mu$ g/L, respectively. By using the indication for the diagnosis that the serum ferritin is lower than 12  $\mu$ g/L, the prevalence of iron deficiency anemia was 19.9 %. Hemoglobin electrophoresis, performed in 1,303 cases, showed abnormal pattern in 28.2 % (Table 4). Approximately 41 percent of anemic mothers had abnormal hemoglobin electrophoresis. While only 25 percent of non-anemic mothers had abnormal pattern. The most frequent abnormal hemoglobin electrophoresis was heterozygous hemoglobin E.

**Table 1.** Baseline characteristics in 1,304 pregnant women.

Characteristic	Case	Percentage
Profession		
Office employee	793	60.8
Government employee	13	1.0
Business owner	93	7.1
Housewife	405	31.1
Income (Baht/month)*		
< 5,000	405	28.9
5,000-9,999	713	56.3
10,000-19,999	145	11.4
>20,000	43	3.4
Education		
Illiteracy	18	1.4
Primary school	749	57.4
Secondary school	402	30.8
College school	101	7.8
Bachelor at least	34	2.6

\* Data available in 1,267 pregnant.

**Table 2.** The prevalence of anemia in each trimester.

Trimester	No. of pregnant women		Prevalence of anemic women	
	number		number	%
First	609		90	14.8
Second	594		122	20.5
Third	101		39	38.6
Total	1,304		251	19.2

**Table 3.** Serum iron and ferritin levels in anemic mothers.

Factor	No. of case (%)
Serum iron ( $\mu$ g/dL)	
< 60	31 (19.3)
$\geq$ 60	130 (80.7)
Serum ferritin ( $\mu$ g/L)	
< 12	32 (19.9)
$\geq$ 12	129 (80.1)

**Table 4.** Hemoglobin electrophoresis in pregnant women with and without anemia.

Type	Number of pregnant women with anemia (%)	Number of pregnant women without anemia (%)	Total *
A <sub>2</sub> A	149 (11.4)	787 (60.4)	936 (71.8)
E trait	82 (6.3)	253 (19.4)	335 (25.7)
β thal/Hb E	3 (0.2)	0	3 (0.2)
Hb CS	3 (0.2)	3 (0.2)	6 (0.5)
Hb H	4 (0.3)	2 (0.2)	6 (0.5)
β thal trait	9 (0.7)	6 (0.5)	15 (1.1)
Hb S	0	1 (0.1)	1 (0.1)
Hb A Bart's	1 (0.1)	0	1 (0.1)
Total	251	1,052	1,303

Note : Hemoglobin electrophoresis were performed in 1,303 cases.

## Discussion

In this study, the prevalence of anemia among pregnant women who attended the antenatal care clinic at King Chulalongkorn Memorial Hospital from November 1, 1995 to January 1, 1996 was 19.2%. This result was similar to the study of Areekul who reported that the prevalence of anemia among pregnant women in Bangkok was 21.8 %.<sup>(7)</sup> However, Valyasevi and colleagues previously reported that the prevalence of anemia among pregnant women in the same area was 31.0 %.<sup>(8)</sup> This may be due to the cut-off value for diagnosis of anemia and the period of study. The study of Valyasevi and colleagues used hemoglobin level less than 11 g/dL as the cut-off value in each trimester of pregnancy. While our study used CDC criteria, which defined anemia in the second trimester as hemoglobin less than 10.5 g/dL, for the diagnosis of anemia.

As demonstrated by Konggern *et al.*,<sup>(9)</sup> the prevalence of anemia in pregnant women varied according to the criteria for diagnosis. Using the

hemoglobin cut-off value of less than 10 g/dL, the prevalence of anemia in pregnant women was 4.0 %. In contrast, the prevalence was 21.4 % by using a cut-off level of less than 11 g/dL. Waranuntakul<sup>(10)</sup> reported that the prevalence of anemia in 1,303 pregnant women in Saraburi province was switched from 6.9 % to 28.5 % if hemoglobin cut-off level was changed from less than 10 g/dL to less than 11 g/dL.

In 1997, Achalapong<sup>(11)</sup> surveyed 651 pregnant women in Chiangrai province in the northern part of Thailand using hemoglobin less than 10 g/dL as the cut-off point and it was found that the prevalence of anemia was 9.7 %

Compared to the southern area of Thailand, Tintara *et al.*<sup>(12)</sup> surveyed 2,651 pregnant women in Amphur Hat Yai, Songkla province. They found that the prevalence of anemia, with the use of hemoglobin less than 10 g/dL as the criteria, was 23.5 %. The location and period of study and population characteristics such as education, income and culture should be taken into account for the discrepancy.

Throughout the three trimesters, the highest prevalence in this study was shown in the third trimester (38.6 %). Abel *et al.* <sup>(14)</sup> demonstrated that the prevalence of anemia among 845 pregnant women in Vellore, a district of southern India, was highest during the third trimester. They also found that iron deficiency anemia, defined by level of serum ferritin, was more prevalent in the third trimester. It is possible that pregnant women, who first attended the prenatal services during their third trimester, have low iron status during the pre-pregnant period. Another possibility is that they may have no iron supplement in the early period of pregnancy or have pre-pregnant nutritional deficiency anemia. Ho *et al.* <sup>(15)</sup> demonstrated that about 10 percent of previously non-anemic pregnant women who had not received any iron supplement during their pregnancy, had clinical anemia after full-term pregnancy. Half of them had iron deficiency anemia (serum ferritin less than 12 µg/L).

Pelas and colleagues <sup>(16)</sup> demonstrated that serum ferritin was the most sensitive diagnostic test for iron deficiency in pregnant Filipinos. Furthermore, they also found that iron deficiency anemia was more prevalent at term comparing to the first trimester. This result emphasizes that iron supplement is necessary for pregnant women.

This study demonstrated that nearly half of anemic mothers had abnormal hemoglobin electrophoresis which was more prevalent than iron deficiency anemic mothers. While one fourth of non-anemic mothers had abnormal pattern. It is possible that, in low -resource setting, hemoglobin cut-off value can be used as an simple screening method for detecting abnormal hemoglobin electrophoresis.

## Conclusion

Anemia was found in one fifth of pregnant women who first attended the prenatal services and it is more prevalent during the third trimester. Approximately 20 percent of anemic mothers have iron deficiency anemia. In pregnant women, anemia increases the risk of preterm delivery and delivering babies of low-birth weight. Early antenatal visit should be advised both for early detection of anemia and iron supplementation. Moreover, once diagnosed the cause of anemia should be investigated and counseled. Iron supplementation should be taken as early as possible in order to reduce anemia during the third trimester.

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