



## Accuracy of screening tests for iron deficiency anemia in pregnancy.

Bunyarit Sukrat, MD

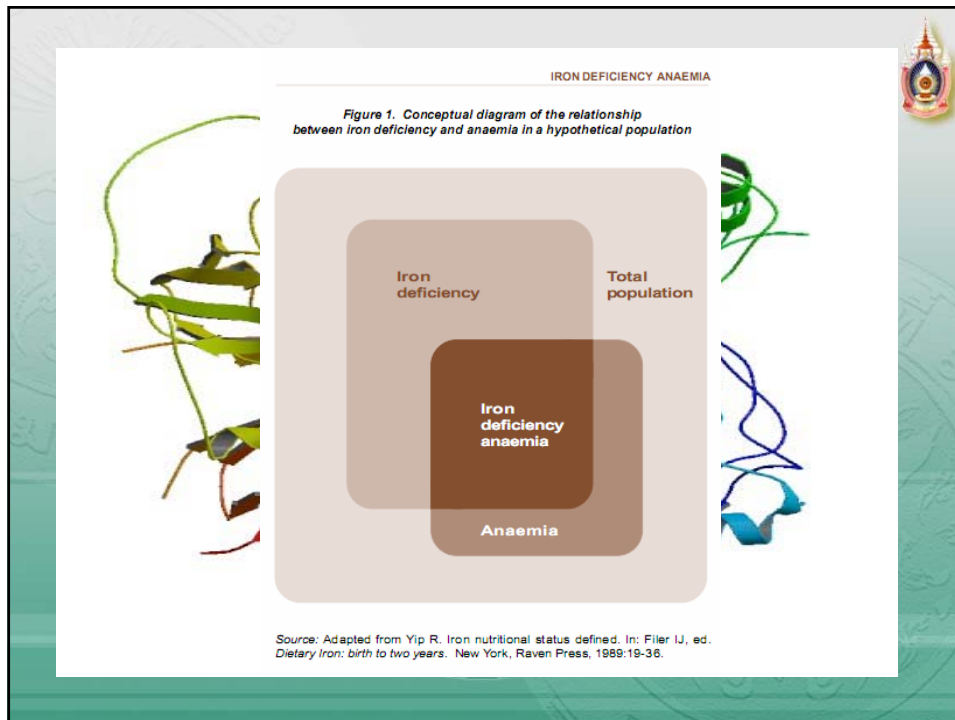
Regional Health Promotion Center 8, Nakornsawan



## Anemia in pregnancy.

- **Most common nutritional problem.**
- The most recently prevalence of anemia among pregnant women worldwide was 42 %\*\* .
- The health effects of anemia, i.e., increased risk of *maternal and child mortality* due to severe anemia, *preterm labor* and *small for gestational age* have been well documented

\*\* Bruno de BN, Ehm ML, Ines EL, Mary CW. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia. Spain: WHO press; 2008. p. 12.



## Anemia in pregnancy.

- The primary cause of anemia in pregnancy is iron deficiency.
- Iron deficiency anemia and anemia are often used synonymously.
- It is generally assumed that 50% of the cases of anemia are due to iron deficiency\*\*.
- **Hemoglobin** concentration is the most reliable indicator of anemia at the population level .

\*\*World Health Organization. Iron deficiency anaemia: assessment, prevention, and control: A guide for programme managers[online]. 2001

## Difficulty in iron assessment.



- Assessment of *bone marrow iron* may be the gold standard for assess body iron stores but it is not suitable for routine clinical practice.
- Other tests i.e., total iron binding capacity, serum iron, transferrin saturation, erythrocyte protoporphyrin, MCV, red blood cell distribution width, and serum ferritin
- Among these tests, *serum ferritin* has the best sensitivity and specificity for diagnosis iron deficiency anemia\*\* .

\*\*Guyatt GH, Oxman AD, Ali M, Willan A, McIlroy W, Patterson C.

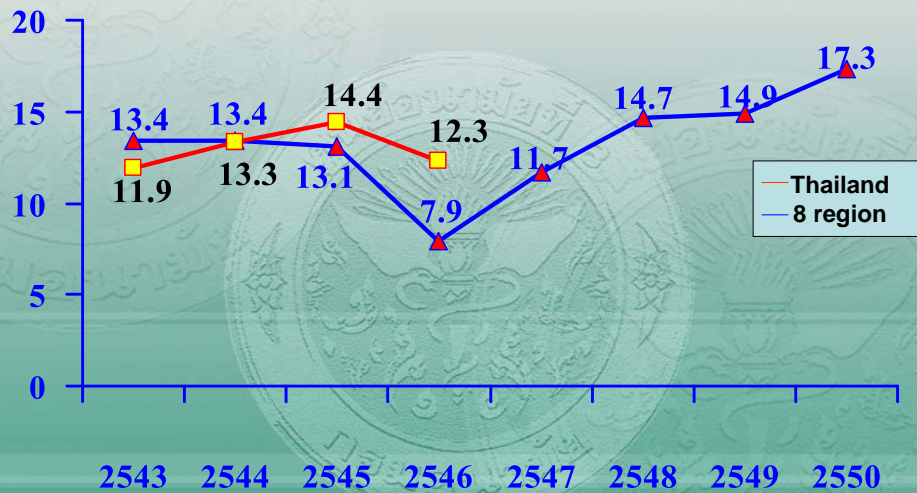
Laboratory diagnosis of iron-deficiency anemia: an overview. J Gen Intern Med 1992;7:145-53.

## Situation in Thailand.



- Use Hematocrit < 33% as national indicator.
- Data about iron deficiency anemia in pregnancy is limited due to difficulty of iron assessment.
- Serum ferritin testing is available only in secondary or tertiary center hospitals.
- Pregnant women with anemia often receive therapeutic trial of iron therapy .

## Situation in Thailand.



## Objectives.



- To compare the accuracy of hemoglobin and hematocrit with difference cut-off value in screening for iron deficiency anemia in pregnancy.
- To determine the prevalence of iron deficiency anemia in pregnancy which defined by serum ferritin.
- To determine the prevalence of thalassemia carriers in both anemic and non-anemic group.



## Method.

Pregnant women 1<sup>st</sup> attended at ANC clinic



Routine ANC Lab included CBC



Hb < 11 g/dl or Hct < 33%



**Serum ferritin**



Data collection + Analysis



## Screening criteria.

Definition of anemia in pregnancy				
	WHO (Hb)	WHO (Hct)	CDC (Hb)	Hb < 10
1 <sup>st</sup> trimester	< 11	< 33	< 11	< 10
2 <sup>nd</sup> trimester	< 11	< 33	< 10.5	< 10
3 <sup>rd</sup> trimester	< 11	< 33	< 11	< 10

\*\*U.S. Preventive Services Task Force. Screening for iron deficiency anemia — including iron prophylaxis. In: Guide to Clinical Preventive Services. 2nd ed.



## Diagnostic criteria.

- Level less than 15 ng/ml confirm IRDA (CDC,1989)
- Cut-off level of **< 30 ng/ml** has 85% PPV and 90% NPV\*\*
- Recommendation from Thai Society of Hematology

\*\* van den Broek NR, Letsky EA, White SA, Shenkin A. Iron status in pregnant women: which measurements are valid? Br J Haematol 1998; 103: 817-24.



## Result & discussion.

	WHO (Hb<11)	WHO (Hct<33)	CDC	Hb<10	Iron deficiency anemia (serum ferritin<30 ng/ml)
First trimester 395 cases	6.1(24)	4.3(17)	6.1(24)	1.0(4)	1.3(5)
Second trimester 137 cases	32.8(45)	22.6(31)	20.4(28)	10.9(15)	15.3(21)
Third trimester 12 cases	50.0(6)	50.0(6)	50.0(6)	16.7(2)	41.7(5)
Total 544 cases	13.8(75)	9.9(54)	10.7(58)	3.9(21)	5.7(31)



## Result & discussion.



	Sensitivity	Specificity	PPV	NPV	Accuracy
<b>WHO(Hb&lt;11)</b>	<b>96.8</b>	91.2	40.0	99.8	<b>91.5</b>
1 <sup>st</sup> trimester	90.0	94.9	16.7	99.7	94.7
2 <sup>nd</sup> trimester	100	79.3	46.7	100	82.5
3 <sup>rd</sup> trimester	100	85.7	83.3	100	91.7
<b>WHO(Hct&lt;33)</b>	<b>77.4</b>	94.2	44.4	98.6	<b>93.2</b>
1 <sup>st</sup> trimester	60.0	96.4	17.6	99.5	95.9
2 <sup>nd</sup> trimester	76.2	87.1	48.4	95.3	85.4
3 <sup>rd</sup> trimester	100	85.7	83.3	100	91.7
<b>CDC</b>	<b>80.6</b>	93.6	43.1	98.8	<b>92.8</b>
1 <sup>st</sup> trimester	80.0	94.9	16.7	99.7	94.7
2 <sup>nd</sup> trimester	76.2	89.7	57.1	95.4	87.6
3 <sup>rd</sup> trimester	100	85.7	83.3	100	91.7
<b>Hb&lt;10 g/dL</b>	<b>35.5</b>	98.1	52.4	96.2	<b>94.5</b>
1 <sup>st</sup> trimester	0	99.0	0	98.7	97.7
2 <sup>nd</sup> trimester	42.9	94.8	60.0	90.2	86.9
3 <sup>rd</sup> trimester	40.0	100	100	70.0	75.0

## Result & discussion.



	Pregnancy without anemia		Pregnancy with anemia (Hb<11 g/dL)	
	Number of cases	%	Number of cases	%
Negative thalassemia screening	300	64.0	32	43.7
<b>Positive thalassemia screening</b>	169	36.0	43	57.3
Normal Hb typing	60	12.8	14	18.7
Alpha thal-1 trait	3	0.6	2	2.7
Hb E trait	102	21.7	22	29.3
Homozygous Hb E	4	0.9	6	8.0
Beta trait	3	0.5	1	1.3
<b>Total thalassemia carriers</b>	112	<b>23.9</b>	31	<b>41.3</b>
<b>Total cases</b>	469	100	75	100



## Conclusions.

- The prevalence of anemia during pregnancy in this study was 9.9, 10.7 and 13.8% by WHO(Hct < 33%), CDC, and WHO(Hb < 11 g/dL), respectively.
- The prevalence of iron deficiency anemia which was diagnosed by serum ferritin level was only 5.7% (31 cases).
- By trimester, the prevalence of iron deficiency anemia in this study was 1.3, 15.3 and 41.7% in first, second and third trimester respectively.



## Conclusions.

- *WHO (Hb <11 g/dL) criteria* was the best screening test in this study due to it's high sensitivity(96.8%) when compare with other diagnostic criteria(35.5-80.6%).
- The specificity, PPV, NPV and accuracy of tests was not difference among these diagnostic criteria.
- The prevalence of thalassemia carriers in anemic pregnant women was higher than the prevalence in those without anemia(41.3 and 23.9%).



Thank you for your attention.

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