ANEMIA AND IRON STATUS OF MALAY WOMEN ATTENDING AN ANTENATAL CLINIC IN KUBANG KERIAN, KELANTAN, MALAYSIA

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Abstract. The purpose of this study was to detect the frequency of iron deficiency anemia in women attending their first antenatal clinic at a Maternal and Child Health Clinic in Kubang Kerian, a district of Kelantan that is located on the East coast of Malaysia. A cross-sectional study was done over a two-month period and fifty-two Malay women were enrolled in this study. Red blood cell indices and serum ferritin were used as a screening tool for anemia and iron status. Eighteen patients (34.6%) were anemic. The majority were classified as having mild anemia (90%). Four of them had hypochromic microcytic anemia. Of 52 women, 7 had iron deficient erythropoiesis and 11 (61.1%) had iron deficient anemia. The prevalence of iron deficiency anemia in pregnant women was 21.2%, which is similar to other developing countries. The serum ferritin level was significantly associated with the hemoglobin level (p=0.003). Other red blood cell indices were not useful in predicting iron deficient erythropoiesis. It is important to detect iron deficient erythropoiesis during the first antenatal check-up, as it is an early manifestation of iron deficiency anemia. In conclusion, screening for iron deficient is recommended during first antenatal visit because iron deficiency anemia is still the leading cause of nutritional deficiency in pregnant women. This will initiate an early therapeutic intervention so as to reduce public health problem.

INTRODUCTION

Anemia is the most common hematological problem in pregnancy. In pregnancy the diagnosis of anemia may be influenced by physiologic changes. During the first and second trimesters, hemoglobin and hematocrit decrease as the maternal blood volume expands. With adequate iron intake, there is a rise in hemoglobin and hematocrit during the third trimester.

In developing countries, 55-60% of pregnant women are anemic; 18% in developed countries (WHO, 1992). The prevalence of anemia in pregnancy in Singapore is 8-30% (Singh and Fong, 1998). Iron deficiency is the most prevalent single nutritional deficiency, affecting approximately 20% of the world's population (William, 2000). There is a great difference in the prevalence of iron deficiency anemia (IDA) between developing countries (25-35%) and industrialized countries (5-8%). In developing countries, IDA is more prevalent as the food contains less iron and parasitic infections are common.

The demand for iron is elevated in pregnant women from 0.8 mg/day in early pregnancy to 7.5 mg/day during the latter part. At least 20% of women not taking iron supplements have iron deficiency anemia. An earlier study by Tee *et al* (1984) done among Malaysian pregnant women from a lower social-economic group indicated the prevalence of anemia was 30-40%. Since then, Malaysia has had tremendous economic changes and is expected to have changes in the prevalence of anemia as well. Our aim was to detect the frequency of iron deficiency anemia in women attending a prenatal clinic in Kubang Kerian, a district of Kelantan located on the East coast of Malaysia, in which ethnic Malays are in the majority.

MATERIALS AND METHODS

A cross-sectional study was performed.

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Fifty-two Malay women who came for their first prenatal visit at the Hopital Universiti Sains Malaysia and the Maternal and Child Health Clinic Kubang Kerian over a two-month period were included in the study. The clinic manages approximately 300 pregnant women monthly. Kubang Kerian is a small town in Kelantan with the majority of the population being middle class.

The subjects had blood taken for a complete blood count and serum ferritin level. Based on the results of the laboratory investigations, we classified the women by the type and severity of anemia. Anemia in pregnancy is defined as a hemoglobin less than 11.0 g/dl. Women were classified as iron deficient if their serum ferritin level was less than 30 μg/l (William, 2000). Iron deficiency anemia was defined as anemia with a low serum ferritin level, while iron deficient erythropoiesis was defined as a normal hemoglobin with a low serum ferritin level.

The comparison of data between the iron status groups was performed using a One-way ANOVA or Kruskal-Wallis test as appropriate. The chi-square or Fisher's exact test was used to examine the relationship between the serum ferritin level and the initial random blood counts. Two-sided hypotheses testing was used in all analyses with $p<0.05$ being considered statistically significant. All the analyses were done using SPSS for Windows.

RESULTS

Fifty-two Malay women who came for their first antenatal visit over a two-month period were reviewed. The means for hemoglobin, serum ferritin, mean corpuscular volume (MCV) and mean cell hemoglobin concentration (MCH) were 11.3 g/dl, 84.23 μg/dl, 105.7 fl and 29.5 pg, respectively.

Anemia was detected in 18 pregnant women (34.6%). The majority had mild anemia (hemoglobin 9 to 11 g/dl). Only one was classified as having moderate anemia (hemoglobin 7 to 9 g/dl). Based on red cell indices, microcytic and hypochromia anemia was found in 4 pregnant women (7.7%). Normochromic-normocytic anemia was noted in 14 women pregnant (92.3%). Based on serum ferritin levels, 18 pregnant women (34.6%) had iron deficiency. Iron deficiency was not the cause in the women with moderate anemia. In the 18 women with low serum ferritin levels, 11 pregnant women (21.2%) had anemia. Of the 52 pregnant women who were reviewed, 11 (21.2%) were diagnosed as having iron deficiency anemia, 7 (13.5%) had iron erythropoiesis anemia and 34 (65.3%) had non-iron deficiency anemia. Only two women with iron erythropoiesis had microcytic hypochromic anemia.

Both, hemoglobin and serum ferritin levels were significantly different among the groups with of iron deficiency ($p<0.001$). There was no significant difference among the groups regarding the mean corpuscular volume (MCV) and mean cell hemoglobin concentrations (MCH) (Table 1).

The serum ferritin level was significantly

Table 1
Random blood count (RBC) and serum feritin levels in 52 pregnant women.

Variable	Iron deficiency anemia (n=11) Mean (SD)	Iron erythropoiesis anemia (n=7) Mean (SD)	Non-iron deficiency anemia (n=34) Mean (SD)	*F*-stat (df))	p-value
Hemoglobin (g/dl)	10.1 (0.7)	11.7 (0.5)	11.7 (1.2)	9.79 (2, 49)	<0.001
MCV[a] (fl)	86.9 (6.0)	88.9 (2.8)	88.8 (7.9)[c]	0.94 (2)[d]	0.625
MCH[b] (pg)	28.9 (2.6)	29.7 (0.9)	29.7 (1.8)	0.78 (2, 49)	0.466
Serum ferritin (μg/l)	14.9 (8.2)	19.3 (8.0)	89.2 (100.1)[c]	34.83 (2)[d]	<0.001

[a]Mean corpuscular volume (fl); [b]Mean corpuscular hemoglobin concentration (pg)
[c]The distribution skewed to the right, median (IQR) was used.
[d]The assumptions of One-way ANOVA were not met, The Kruskal-Wallis test (Pearson χ^2 -stat) was used.

Table 2
Association between serum feritin level and hemoglobin level, mean corpuscular volume level or mean corpuscular hemoglobin concentration.

Variable	Serum feritin level (μg/l)		χ^2-stat (df)	p-value
	Low [n (%)]	Normal [n (%)]		
Hemoglobin level (g/dl)			8.54 (1)	0.003[a]
Low	11 (61.1)	7 (20.6)		
Normal	7 (38.9)	27 (79.4)		
Mean corpuscular volume (fl)				0.728[b]
Low	1 (5.6)	2 (5.9)		
Normal	17 (94.4)	32 (94.1)		
Mean corpuscular hemoglobin concentration (pg)				0.461[b]
Low	3 (16.7)	4 (11.8)		
Normal	15 (83.3)	30 (88.2)		

[a]Chi-square test; [b]Fisher's exact test was used because the chi-square test assumptions were not met.

associated with hemoglobin levels (p=0.003). There was no significant relationship between the serum ferritin levels and the mean corpuscular volume (MCV) or mean cell hemoglobin concentration (MCH) (Table 2).

DISCUSSION

Anemia is a major health risk in pregnancy. The prevalence of anemia in studies done in Singapore was 15.3% and showed that the highest prevalence of anemia was among Malays (Singh and Fong, 1998). According to a WHO report (1992), the prevalence of nutritional deficiency in pregnant women in Southeast Asia was 63%. In our study, anemia was noted in 18 (34.6%) of the Malay women who came for their first antenatal visit, the majority had mild anemia. This frequency is in a range of prevalence between developed (18%) and developing countries (55-69%). Over the years there has been a marked improvement in the prevalence of anemia, consistent with the increase in the Malay social economic status. Kelantan is a state on the East coast of Malaysia with ethnic Malays consisting of 94% of the population. The main etiological factors for anemia in pregnancy worldwide are nutritional anemia, thalassemia, malaria and AIDs (Singh and Fong, 1998). Iron deficiency is the most prevalent single nutritional deficiency. Iron deficiency anemia is defined as anemia with biochemical evidence for iron deficiency. In this study, serum ferittin was the indicator used as biochemical evidence of iron deficiency anemia.

Van den Broek *et al* (1998) recommended the use of serum ferritin as the most sensitive test. In a study done by Haram *et al* (1997), serum ferritin was found to be a reliable indicator of iron status during the first trimester. In our study serum ferritin correlated significantly with low hemoglobin levels (p<0.05), which is similar to the findings by Kiwanuka *et al* (1999). We found 18 pregnant women (34.6%) were iron deficient, and 11 (61.1%) had anemia. Iron deficiency anemia was the commonest type of nutritional deficiency seen in our study. Seven had iron deficient erythropoiesis, as the pregnancy progressed, iron stores were depleted even further and ultimately these women presented with anemia.

Iron deficiency generally develops slowly and may cause functional consequences. The physiological cause of anemia during pregnancy is an increase in plasma volume from 25% to 80%, which begins at about 6 weeks of gestation (Nils Milman *et al*, 2000). According to the WHO, pregnant women need a daily intake of 350 mg iron to maintain an iron balance. At our hospital, all pregnant women are given a 350 mg iron supplement as a prophylaxis. Since the prevalence of iron deficient erythropoiesis is of

moderate magnitude in our studied population, the screening for iron deficiency is recommended and therapeutic doses of iron (600-700mg) are given to iron deficient erythropoiesis women.

In our study, we found that out of four women with microcytic hypochromic anemia (defined by an MCV of less than 80 fl and an MCH of less than 27 pg), two were iron deficient. There was no correlation between serum ferritin levels and a low MCV or MCH ($p<0.05$). The MCV can be used to characterize iron status, but in pregnancy, the MCV is a poor marker of iron deficiency for at least two reasons (Nils Milman *et al*, 2000). First, the physiologic increase in MCV during gestation counterbalances the microcytosis of iron deficiency. Second, erythrocytes have a mean survival of 120 days. It takes a large number of erythrocytes with a small volume to significantly reduce the MCV. This probably explains the changes in MCV observed during late pregnancy.

In conclusion, anemia remains a common problem in pregnant women and iron deficiency anemia is the leading type of nutritional deficiency. Screening for iron deficiency is recommended during early pregnancy in order to reduce public health problems.

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