

RESEARCH ARTICLE

DYNAMIC OF SERUM FERRITIN LEVEL IN FIRST TRIMESTER PREGNANCY

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ABSTRACT

Background: Incidence of anemia in pregnant women was 37.1%, proportion was similar between urban vs rural areas (36.4% vs 37.8%). According to 2007 RISKESDAS, iron deficiency accounted for most common type of anemia in pregnancy. Iron deficiency anemia in pregnancy has a negative impact both on the mother and the fetus. Serum ferritin is a parameter for iron deficiency. Objective of this study was to overlook serum ferritin levels in trimester 1 pregnancy.

Methods: The design was retrospective cohort. Samples obtained from first trimester pregnant women who performed a pregnancy check up at Hasanah Graha Afiah Hospital Depok in the period of April 2016 - July 2017. Data were presented in percentages for categorical data.

Numerical data presented in medians and ranges for abnormal data distribution; and mean and standard intersections for normal data distribution. This study involved 64 samples that met the inclusion and exclusion criteria.

Results: Median serum ferritin levels in this study were still in the normal range of 40.82 (6.97 - 172.66) µg / L. Twenty one subjects (69.1%) had normal serum ferritin level (≥30 µg/L) and 47 (30.9%) had low ferritin level.

Conclusions: Median serum ferritin in this study was within normal range. Low level of serum ferritin found in 21 subjects, three among them also suffered from anemia.

Keywords: Ferritin serum, pregnancy, first trimester

INTRODUCTION

Anemia is a condition frequently found in all age groups, infants to old age.¹ Based on RISKESDAS 2007, microcytic hypochromic anemia was the most common type of anemia in pregnancy. Most of the cases were caused by iron deficiency.² Iron deficiency anemia (IDA) constantly being a worldwide issue, especially among developing countries. Data from WHO stated incidence of IDA in developing countries is higher than in developed countries, with an average prevalence of 52% in developing countries and 22.7% in developed countries.

Depleted iron reserve in the body can occur due to bleeding, inadequate iron intake, impaired absorption, and also an increase in iron demands.^{4,5} Higher demands seen in pregnancy. As much as 1000 mg of iron is needed by pregnant women with a single pregnancy, with a proportion of 300 mg for the fetus and placenta, 500 mg for increasing maternal Hb, and the remaining 200 mg is excreted normally

through the skin, urine and intestines.⁶

Premature births, stunted fetal growth, low birth weight (LBW), iron deficient newborns, abortion, and high risk for cognitive and non developmental disorders-cognitive were some of the reported impact from IDA in pregnancy.⁶⁻⁸ Meinzen-Derr et al., in their study of the risk of anemia in infants of mothers with anemia during pregnancy, reported that infants born to mothers with anemia had a threefold risk of suffering from anemia.⁹

Iron reserves in the body are stored in the form of ferritin. Regardless inflammation, serum ferritin levels with total iron reserves in the body have a positive correlation. Examination of serum ferritin levels for screening IDA before pregnancy or early pregnancy is highly necessary concerning the high number of IDA in Indonesia. Deteriorating impact of IDA in pregnancy on fetus was expected to be decreased with screening, henceforth early management can be done promptly.

METHODS

The study design was retrospective cohort, data reported as descriptive numerical. Data was extracted from medical records of first trimester pregnancy patients visiting Obstetrics and Gynecology Polyclinic Hasanah Graha Afiah Hospital Depok in April 2016 - July 2017 and being examined for hematology and serum ferritin. The exclusion criteria for this study were patients who had an infection or inflammation based on data in the medical record.

Data with categorical variables were presented as percentages. Data on serum ferritin levels were tested for normality using the Kolmogorov-Smirnov test. For normal data distribution ($p > 0.05$), the data will be presented in mean and standard deviations. Data with abnormal distribution ($p < 0.05$) will be presented in the form of medians and ranges. Ethical approval was obtained from the local Ethics Committee of Faculty of Medicine, Syarif Hidayatullah Islamic State University, Jakarta, Indonesia (No.Un.01/F10/KP.01.1/KE.SP/09.12.011.2017).

RESULTS

Baseline characteristics

A total of 68 patients included in the study, mean age was 30.5 ± 4.2 years. Fifty-nine patients (86.8%) were at ideal age for pregnancy and birth (20 to 35 age). Mean hemoglobin among the first trimester pregnancy patients was 12.7 ± 1.2 g/dL. Five of the included patients (7.4%) suffered from anemia (hemoglobin < 11 g/dL). (Table 1)

Table 1. Baseline characteristic

Variable	Frequency (n=68)	Percentage (%)
Age		
▪ < 20 years	0	0
▪ 20 – 35 years	59	86.8
▪ > 35 years	9	13.2
Anemia status		
▪ Anemia (Hb < 11 g/dL)	5	7.4
▪ Not anemia (Hb ≥ 11 g/dL)	63	92.6

Serum ferritin level

Median serum ferritin level was 40.82 $\mu\text{g/L}$ with minimum of 6.97 $\mu\text{g/L}$ and maximum of 172.66 $\mu\text{g/L}$.

Table 2. Serum ferritin level percentage

Ferritin level ($\mu\text{g/L}$)	Frequency (n=68)	Percentage (%)
< 30	21	30.9
≥ 30	47	69.1

Based on Table 2, subjects with normal serum ferritin is superior compared to low serum ferritin level. Forty seven

subjects (69.1%) had normal serum ferritin level (≥ 30 $\mu\text{g/L}$) and 21 (30.9%) had low serum ferritin level.

Based on Table 3, 21 subjects (30.4%) had iron deficiency with low serum ferritin level (< 30 $\mu\text{g/L}$). Among the 21 subjects, 3 subjects suffered from iron deficient anemia (Hb < 11 g/dL). Mean age of the subjects with low serum ferritin was 30.29 ± 4.6 years. Mean hemoglobin of subjects with low serum ferritin was 12.25 ± 1.3 g/dL.

Table 3. Characteristics from low serum ferritin group

Variable	Frequency (n=21)	Percentage (%)
Age (years)		
▪ < 20	0	0
▪ 20-35	17	81
▪ > 35	4	19
Anemia status		
▪ Anemia (Hb < 11 g/dL)	3	14.3
▪ Not anemia (Hb ≥ 11 g/dL)	18	85.7
Newborn's weight (gram)		
▪ < 2500	0	0
▪ 2500 -4000	8	88.9
▪ > 4000	1	11.1

Among subjects with serum ferritin < 30 $\mu\text{g/L}$, 9 (64.3%) had labored in the hospital, 8 (88.9%) had normal birthweight babies (2500 – 4000 gram), while 1 subject (11.1%) had overweight baby (4000 gram). There were no record for diabetes mellitus nor diabetes gestational from medical record data regarding this subject. Birthweight means for babies from low serum ferritin subjects was 3355.6 ± 574.5 gram. There was no low birthweight baby (< 2500 gram) in < 30 $\mu\text{g/L}$ serum ferritin subjects.

DISCUSSION

Indonesian Ministry of Health stated that 20 – 35 age is an ideal period for pregnancy and labor. Under 20 years and over 35 years are considered high-risk period for pregnancy and labor.¹⁰ This is in line with our study result.

In first trimester, ratio between hemoglobin and plasma is equal, this was reflected in our result where majority of subject did not suffer from anemia.⁶ Five subjects (7.4%) suffered from anemia with hemoglobin concentration below < 11 g/dL. Low iron reserve state in pre-pregnancy, insufficient nutrition, malabsorption, and other factors may be accounted for this result.⁷

Low iron intake among women in developing country frequently put them in an latent iron deficiency state since pre-pregnancy. Pregnancy in these anemic women will aggravate the anemia due to increasing demand of iron occurred in pregnancy.⁷

Study from Ani in 276 pre-pregnancy women, resulted 53 (19.2%) subjects had iron deficiency and 39 (14.1%) had iron deficient anemia.⁷

Serum ferritin level reflected the reticuloendothelial iron reserve in human body. Normal serum ferritin level is $\geq 30 \mu\text{g/L}$.^{7,11-14} Normal serum ferritin level was obtained from this study. In first trimester pregnancy, additional iron was still not needed by the mother, fetus, and placenta, hence, body's iron reserve is still able to suffice erythropoiesis.⁷

Iron deficiency or iron deficiency anemia caused by the absent or low iron reserve had negative impact on the mother and the baby. Among those impacts were abortus, low birthweight, iron deficient newborn, and an increment in fetomaternal morbidity and mortality.^{7,8}

According to study from Labir, anemic pregnant women or iron deficiency in first trimester has 10.29 times more likely to give birth to low birthweight babies compared with non-anemic pregnant women.¹⁵ In this study, no low birthweight babies were documented among iron deficient subjects and normal iron subjects. There are many other factors attributed to low birthweight such as twin pregnancy, mother's weight, nutrition status, and age of pregnancy.¹⁶

CONCLUSION

Median serum ferritin in this study was within normal range. Low level of serum ferritin found in 21 subjects, three among them also suffered from anemia. Mean age of subjects with low level of serum ferritin was 30.29 ± 4.6 years. Mean hemoglobin in low level of serum ferritin was 12.25

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