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Three-Month Iron Supplementation as Treatment for Microcytic Hypochromic Anemia in Pregnancy

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Abstract

In pregnant women there is a twofold increase in iron requirements due to increased blood volume without the expansion of plasma volume. Pregnant women are very prone to suffering from iron deficiency anemia. Iron deficiency anemia generally has an erythrocyte index which represents hypochromic microcytic. This study aimed to determine the effect of three-month iron tablet supplementation as a therapy against microcytic hypochromic anemia in pregnancy. This was a quantitative quasi-experimental study using pre-test and post-test design. The study was conducted in May-September 2020 at the Arifin Achmad Regional General Hospital, Riau Province, Indonesia. Subjects were 30 pregnant women with microcytic hypochromic anemia. Primary data were analyzed using statistical paired sample t-tests. Results showed that there was an increase in hemoglobin levels after the supplementation of iron tablet from an average of 9.1±1.2 gr/dL to 11.8±1.0 g/dL. This change was significant based on the results of the T-test (p-0.003) Thus, iron supplementation for three month significantly increases hemoglobin levels in pregnant women.

Keywords: Iron supplementation, microcytic hypochromic anemia, pregnancy

Suplementasi Zat Besi Selama 3 Bulan sebagai Tatalaksana Anemia Mikrositik Hipokrom Dalam Kehamilan

Abstrak

Pada ibu hamil terjadi peningkatan kebutuhan zat besi dua kali lipat akibat peningkatan volume darah tanpa ekspansi volume plasma. Ibu hamil sangat rentan untuk menderita anemia defisiensi besi. Anemia defisisensi besi umumnya memiliki gambaran indeks eritrosit sebagai mikrositik hipokrom. Penelitian ini bertujuan mengetahui efek suplementasi tablet besi selama tiga bulan sebagai terapi terhadap anemia mikrositik hipokrom dalam kehamilan. Jenis penelitian yang digunakan yaitu penelitian kuantitatif, dengan desain penelitian quasi eksperimen jenis *one group pre-test* dan *post-test.* Penelitian dilakukan pada bulan Mei–September 2020 di Rumah Sakit Umum Daerah Arifin Achmad Provinsi Riau. Subjek penelitian ini adalah 30 ibu hamil dengan anemia mikrositik hipokrom. Dilakukan analisis pada data primer dengan menggunakan uji statistik *paired sample t-test.* Hasil penelitian menunjukkan kenaikan rata-rata kadar hemoglobin dari sebelum pemberian suplementasi zat besi, yaitu 9,1±1,2 gr/dL menjadi 11,8±1,0 gr/dL (sesudah pemberian tablet besi). Perubahan ini signifikan berdasar atas hasil uji-t (p=0,003). Simpulan, suplementasi zat besi selama tiga bulan secara signifikan meningkatkan kadar hemoglobin pada ibu hamil.

Kata kunci: Anemia mikrositik hipokrom, kehamilan, tablet besi

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Introduction

Pregnant women are vulnerable to malnutrition due to an increase in nutritional needs to meet the needs of mother and fetus. One of the most common nutritional problems in pregnant women is nutritional anemia, which is the biggest and most difficult micro-nutrition problem to overcome in the world.[1,2] The World Health Organization (WHO) reports that 52% of pregnant women experience anemia in developing countries. In Indonesia, based on the Indonesian National Socioeconomic Survey and the Ministry of Health-Unicef Survey, it is reported that of of 4 million pregnant women surveyed, half experienced nutritional anemia and one million experienced chronic energy deficiency at the time of the survey.[3]

A report by United States Agency for International Development (USAID) on its Micronutrient and Child Blindness Project and Food and Nutrition Technical Assistance shows that about 50% of all types of anemia are thought to result from iron deficiency. Iron deficiency anemia often occurs due to the fact that pregnant women experience a twofold increase in iron demand due to increased blood volume without expansion of plasma volume to meet maternal needs, which is to prevent blood loss during childbirth and to support fetal growth. Iron deficiency anemia is reflected in the erythrocyte index in the form of microcytic hypochromic anemia. [4]

There is a close correlation between anemia during pregnancy and fetal death, abortion, congenital defects, low birth weight, and reduced iron stores in children or children born with nutritional anemia. This condition causes the perinatal mortality, as well as maternal mortality and morbidity, to remain high. In addition, anemia could worsen and cause bleeding during childbirth, which is the main cause (28%) of maternal mortality/childbirth in Indonesia. Anemia in pregnancy is linked to post partum hemorrhage in terms of uterine atony. Decreased uterine blood flow or low uterine muscle strength may contribute to inefficient uterine contractility, leading to uterine atony.[5] Therefore, this study aimed at exploring the effect of three-month iron provision as a therapy for microcytic hypochromic anemia in pregnant women visiting the Arifin Achmad General Hospital, Riau, Indonesia in order to reduce complications of anemia as well as maternal and fetal mortality and morbidity.

Methods

This study was conducted from May 2020 to September 2020 at the Midwifery Clinic of the Arifin Achmad General Hospital, Pekanbaru, Riau, Indonesia. The sample size for the study was determined using the Slovin technique, and resulting in a minimum of 30 samples. Sampling was performed purposively by applying certain considerations or special selection. The inclusion criteria were pregnant women with hypochromic microcytic anemia while the exclusion criteria were pregnant women with congenital blood disorders, kidney disorders, and acute bleeding. The hemoglobin level and the levels of mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) were assessed in subjects to identify pregnant women with hypochromic microcytic anemia. They were then asked to participate in the study and included as samples after consent. Subjects were given iron tablets for 3 months, with a total of 90 iron tablets. At the second visit, which was done 3 months after the start of iron supplement provision, the anemia status was re-evaluated by measuring the hemoglobin levels in pregnant women.

Data collected consisted of primary data that were obtained directly using a hematological measuring device, Sysmex XN-1000, manufactured in 2019. Data collected were differences in hemoglobin levels in pregnant women before and after consuming Fe tablets These data were then presented in the form of a descriptive table. Data analysis was conducted to identify the relationship between Fe tablet consumption and anemia improvement in pregnant women visiting the Arifin Achmad General Hospital, Riau, Indonesia.

This study was a quantitative one group pretest-posttest study. The population was all pregnant women (n=102) who visited Arifin Achmad General Hospital, Riau, Indonesia for antenatal care visits from May to September 2020. Sampling was performed purposively with a sample size of 30. Data analysis was performed statistically using the test T dependent sample. The ethical clearance for the study was obtained from the Ethical Study of the Faculty of Medicine, Riau University, with the issuance of the ethical clearance No: B/137/UN19.5.1.1.8/ UEPKK/2020.

Table 1 Subject Characteristics

Parameter	(n=30)
Education	
Do not graduate from senior high school	7
Senior high school/ equal	15
Higher education graduate/ equal	8
Age	
<20 y.o	2
20-30 y.o	25
>30 y.o	3
Gravida	
Primigravida	3
Multigravida	27
Pregnancy gap on multigravida	
<2 years	7
>2 years	20

Results

Analysis was performed on a total 30 subjects with anemia in this study. Data on subject characteristics collected were age, education level, number of parity, and spacing between pregnancies. Results of the analysis are presented in Table 1, showing that low level of education did not guarantee a pregnant woman to have anemia as the highest incidence of anemia was found in patients with middle level of education, followed by those with a high level of formal education. By age, younger pregnant women and older pregnant women also did not contribute to the majority of pregnant women with anemia. It was found that the majority of pregnant women suffering from anemia was in their middle age.

Multigravida pregnant women, or women with more than one parity, appeared to contribute more to the group of women with anemia when compared to primigravida pregnant women. In terms of pregnancy spacing, women whose pregnancy interval was more than 2 years seemed to contribute more to the group of pregnant women with anemia compared to those whose pregnancy interval was less than two years.

When the effects of iron supplementation was analyzed in the subjects, it was demonstrated that a significant increase in the HB level was seen after iron supplementation (p=0.003) as described in Table 2.

Table 2 Comparison of Hb Levels Before and After Iron Supplementation

Hemoglobin Levels (Hb)	Hb (gr/dL) mean±SD	p
Hb before	9.1±1.2	0.003
Hb after	11.8±1.0	

Discussion

In this study, the average baseline hemoglobin level of pregnant women with anemia before iron (Fe) supplementation was 9.1±1.2. After the intervention of providing iron supplementation in the form of iron tablets, the average hemoglobin level of these subjects increased to 11.8±1.0. When analyzed statistically using the the t test, it was presented that the change in the hemoglobin level after iron suplementation was statistically significant with a p-value of 0.003, or less than 0.05.

The increased hemogloblin level from 9.1 g/dL to 11.8 g/dL indicates an increase of 2.7 g/dL in hemoglobin level after the consumption of iron tablets. Age did not affect the hemoglobin level of anemic pregram women; however, the low hemoglobin level among these women was more influenced by the lack of consumption of iron-containing food and substances that can suppress iron absorption.[6] This finding is in line with a study conducted by Fatima et al. in Tamamaung Public Health Center in 2011 and another previous study by Ratih et al that suggested an increase in hemoglobin level by 3.7 g/dL on average among anemic pregnant women with iron supplementation.[2,7]

Iron supplementation remains the most frequent effort to increase hemoglobin levels in pregnant women prone to anemia. A study conducted by Vazquez et al. stated that iron supplementation at a dose of 40–80 mg per day (with an average of 60 mg per day) leads to a much better outcome compared to 20–40 mg iron supplementation per day with no adverse effects observed in the mother and fetus.[8]

Studies by Abu Ouf et al. and Arija et al. on pregnant women with anemia given iron tablet supplementation for 1–3 months also showed the same outcome as this study. The supplementation increases maternal hemoglobin levels and results in a better outcome in infants.[6,9] Their findings also emphasize that all pregnant women are prone to anemia, regardless their body mass index. Thus, iron supplementation

must be encouraged for all groups of pregnant women.[10]

According to the Dietary Reference Intake, pregnant women's need for iron increases from 18 mg/day before pregnancy to 27 mg/day during pregnancy. The World Health Organization (WHO) also recommends that every pregnant woman should consume Fe supplement of 60 mg per day for 6 months. Providing iron supplementation of 60 mg/day can increase the hemoglobin level by 1 g%/month.[11] This is supported by the findings of this current study that an average increase in hemoglobin of 2.8 g/dL is observed after 3 months of iron supplementation.

This study has limitations because it did not directly monitor iron consumption so adherence could not be guaranteed. The ferritin level before and after iron supplementation was also not measured. Studies with larger sample size and better monitoring on adherence will be needed for better understanding on the effect of iron therapy in pregnant women. Despite these limitations, the increse in Hb level after 3 months of consuming iron tablet of 2.7 g/dL indicates an excellent hemoglobin response to iron supplementation.

In conclusion, three months of iron supplementation improves the hemologlobin level of women suffering from microcytic hypochromic anemia in pregnancy.

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