



Comparison of Maternal Outcomes of Daily and Weekly Iron Tablet Supplementation in Pregnant Women in Coastal Region, Medan, Indonesia

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Abstract

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BACKGROUND: Weekly consumption of iron supplementation is preferred to daily consumption of iron supplementation because of its minimal side effects and higher level of compliance.

AIM: This study is to compare the maternal outcomes in pregnant women with daily and weekly consumption of iron supplementation in coastal region.

METHODS: This prospective cohort study was conducted from July 2018 to January 2019 in Belawan Health Center and Medan Deli Health Center. Sixty-two pregnant women who met inclusion and exclusion criteria were given iron supplement everyday (Group 1, n = 29) and twice a week (Group 2, n = 33). Hemoglobin levels, hematocrit, and ferritin serum are tested before starting the iron supplementation. All numerical data were analyzed using t-test.

RESULTS: There is no significant difference in mean hemoglobin and hematocrit before and after iron supplementation $p = 0.222$ and $p = 0.793$, respectively, however, decreasing level of ferritin serum from 41.21 to 26.29 ng/ml ($p = 0.001$) is found. Hemoglobin, hematocrit, and ferritin serum means, before and after supplementation were not statistically different between daily and weekly group ($p = 0.421$, $p = 0.197$, $p = 0.917$).

CONCLUSION: To prevent iron deficiency anemia in pregnant women, weekly or daily iron supplementation show similar effectiveness although continuous consumption of iron supplementation during breastfeeding period is needed to restore iron loss during pregnancy.

Introduction

Iron deficiency anemia has been a common nutritional problem in pregnant women; it is due to increasing iron requirements in pregnant women, especially in the second and third trimesters [1]. Iron deficiency anemia increases the risk of post-partum hemorrhage that causes maternal mortality in Indonesia.

Therefore, the Indonesian government made a policy of giving daily 90 iron tablets for 3 months during antenatal care [2]. Meta-analysis of Haider *et al.* showed that iron tablet supplementation increases the maternal hemoglobin concentration of 0.46 g/dl compared to controls and effectively reduces the risk of iron deficiency anemia [3].

However, it is important to consider that the absorption of intestine to iron is limited; therefore, the supplementation is not only useless but also increasing side effects [4]. Recent studies found that daily iron

supplements increase lipid peroxidation [5] and reduce zinc absorption [6], [7]. Frazer *et al.* showed that periodic iron supplementation enhances mucosal healing and increase iron absorption [8].

Several studies have been conducted to find alternative regimens for iron administration in pregnant women that will minimize side effects and affect compliance [9], [10], [11], [12]. Recent studies showed that weekly iron supplementation has the similar effectiveness as daily iron supplementation in non-anemic pregnant women [12] and reduce the risk of high hemoglobin concentration in the middle and end of pregnancy [13]. Mukhopadhyay *et al.* stated that weekly iron supplementation was an effective choice for prophylaxis in non-anemic pregnant women, but is not beneficial in anemic women [14]. Majority of people living in coastal areas have low socio-economic levels [15]. This study aims to compare the maternal outcomes between pregnant women with daily and weekly iron supplementation in Indonesian coastal region.

Materials and Methods

Samples and data collection

This prospective cohort study was conducted from July 2018 to January 2019 involving 201 pregnant women who came to Belawan Health Center and Medan Deli Health Center. The inclusion criteria were non anemic pregnant women with gestational age of 13–28 weeks, pregnant women who approved informed consent and could provide contact person for follow-up. The exclusion criteria were pregnant women with malignancies and multiple pregnancies.

Blood count and ferritin serum level were examined at the first visit. Samples were divided into two groups. The first group was given daily iron supplements while the second group was given iron supplements twice a week on Tuesday and Friday for 3 months. One iron tablet contains 180 mg of ferrous fumarate and 400 g of folic acid. The tablets were manufactured by *Phapros^{Rx}*. After 3 months, the patients were contacted by mobile phone or through their midwife to come to the Health Center for routine blood evaluation and ferritin serum levels. The blood samples were examined by Prodia Laboratory using Sysmex XN 1000.

Statistical analysis

Data were analyzed using SPSS software. Age, gestational age, history of pregnancy, and hematological value of the daily and weekly supplementation groups were analyzed using independent-t test. Blood count and ferritin serum levels before and after supplementation were analyzed using paired-t test. Significant value was set at $p < 0.05$.

Results

The area of research in our study is about 21.82 km² with a height about 3 m above sea levels. The northern part of the area is directly adjacent to the Malacca Strait. The mean population density is 4499 people/km² [16]. Average net income per month of the population in the research area was less than 2 million rupiah which is the average income in Indonesia [17].

From 201 pregnant women included in this study, only 62 subjects could be admitted for the evaluation of iron supplementation for 3 months based on selection criteria. The daily iron supplementation groups were 29 pregnant women (46.77%) and the weekly supplementation groups was 33 pregnant women (53.23%). Subject characteristics are shown in Table 1. The mean age of subjects was 27.87 ± 5.96

years with the youngest age was 19 years and the oldest age was 40 years. The mean gestational age was 21.02 ± 4.90 weeks with the youngest gestational age was 12 weeks and the oldest was 31 weeks. There were no significant differences in age and gestational age between the daily iron supplementation groups and the weekly groups ($p > 0.05$).

Table 1: Characteristics of the subjects

Characteristics	Daily (n = 29)	Weekly (n = 33)	p value
Age (years)	28.55 ± 6.06	27.27 ± 5.90	0.404
Gestational age (weeks)	20.46 ± 4.54	21.50 ± 5.22	0.419
History of pregnancy			
Primigravida	7 (24.14)	9 (27.27)	
Secundigravida	12 (41.38)	10 (30.30)	
Multigravida	9 (31.03)	13 (39.39)	
Grand emultigravida	1 (3.45)	1 (3.03)	
Initial hematological value			
Hemoglobin (g/dl)	11.60 ± 0.95	11.33 ± 0.96	0.272
Hematocrit (%)	34.20 ± 2.41	33.76 ± 2.02	0.572
Platelet (x 10 ³ /μl)	309.52 ± 50.89	297.82 ± 60.33	0.416
Leukocytes (x 10 ³ /μl)	10.83 ± 2.53	10.24 ± 2.29	0.341
ESR (mm/hour)	60.97 ± 29.05	56.00 ± 19.29	0.438
Serum ferritin (ng/ml)	43.32 ± 32.72	39.35 ± 35.17	0.648

Regarding the history of pregnancy, 16 subjects (25.81%) were primigravida, 22 subjects (35.48%) were secundigravida, 22 subjects (35.48%) were multigravida, and two subjects (3.23%) were grand emultigravida. Before iron supplementation, there were no significant differences in the mean hemoglobin levels, hematocrit, and serum ferritin between the daily and weekly iron supplementation groups ($p > 0.05$). Of all subjects enrolled in this study, there was no significant difference between the mean hemoglobin levels before iron supplementation (11.46 ± 0.96 g/dl) and after three months of supplementation (11.30 ± 0.85 g/dl) ($p = 0.222$).

The mean hematocrit before iron supplementation was $34.00 \pm 2.61\%$ and the mean hematocrit after iron supplementation was $34.11 \pm 2.56\%$ ($p = 0.793$). The mean ferritin serum levels after iron supplementation was lower (26.29 ± 21.84 ng/ml) compared to those before iron supplementation (41.21 ± 33.82 ng/ml) ($p = 0.001$).

In the daily group, there were no significant differences in the mean hemoglobin levels before and after iron supplementation (11.60 g/dl vs. 11.33 g/dl, $p = 0.141$), as well as the weekly group (11.33 g/dl vs. 11.27 g/dl, $p = 0.744$) (Table 2). However, the mean ferritin serum levels after iron supplementation was significantly lower compared to those before supplementation (27.90 ng/ml vs. 43.32 ng/ml, $p = 0.013$). As the daily group, the mean of ferritin serum before supplementation in weekly group was lower compared to those after supplementation (24.87 ng/ml vs. 39.35 ng/ml), but not statistically different ($p = 0.070$). The differences of the mean hemoglobin levels and the difference of the mean ferritin serum levels between daily and weekly group were not statistically different (0.27 vs. 0.06 g/dl, $p = 0.421$) for hemoglobin concentration and 15.42 vs. 14.47 ng/ml, $p = 0.917$) for ferritin serum (Table 2).

Table 2: Hematological value of the initial and the final of supplementation

Hematological value	Daily (Mean ± SD)			Weekly (Mean ± SD)			p value
	Before supplementation	After supplementation	Difference	Before supplementation	After supplementation	Difference	
Hemoglobin (g/dl)	11.60 ± 0.95	11.33 ± 0.74	0.27 ± 0.96	11.33 ± 0.96	11.27 ± 0.95	0.06 ± 1.06	0.421
Hematocrit (%)	34.20 ± 2.41	33.76 ± 2.02	0.44 ± 2.4	33.76 ± 2.02	34.41 ± 2.94	-0.59 ± 3.62	0.197
Platelet($\times 10^3/\mu\text{l}$)	309.52 ± 50.89	293.76 ± 55.86	15.76 ± 44.07	297.82 ± 60.33	316.33 ± 69.49	-18.52 ± 51.10	0.007
Leukocyte ($\times 10^3/\mu\text{l}$)	10.83 ± 2.53	10.29 ± 1.87	0.54 ± 1.92	10.24 ± 2.29	10.02 ± 2.26	0.22 ± 2.31	0.551
ESR (mm/hour)	60.97 ± 29.05	49.69 ± 22.07	11.28 ± 22.18	56.00 ± 19.29	49.45 ± 14.91	6.55 ± 19.82	0.379
Serum ferritin (ng/ml)	43.32 ± 32.72	27.90 ± 24.49	15.42 ± 31.53	39.35 ± 35.17	24.87 ± 19.50	14.47 ± 38.57	0.917

Discussion

Iron supplementation is highly recommended to prevent iron deficiency anemia in pregnant women. These were due to increasing iron requirement for the growth of the placenta and fetus [18]. This study aims to compare the anemia level of pregnant women with daily and weekly iron supplementation who attended Belawan Health Center and Medan Deli Health Center. Our study showed decreasing level in hemoglobin before and after iron supplementation in the daily group as well as the weekly group, but it was not statistically significant. The change of hemoglobin concentration was not statistically different between daily and weekly groups ($p = 0.421$). A recent study found that in non-anemic pregnant women, the weekly iron supplementation was an effective alternative to the daily supplementation for preventing anemia and iron deficiency [19]. The weekly iron supplementation benefits pregnant women in serum iron and total iron binding capacity (TIBC) [20]; therefore, iron deficiency anemia in pregnant women can be prevented.

The difference of ferritin serum before and after iron supplementation between daily and weekly group was not statistically different ($p = 0.917$). This result was similar with the study by Goonewardene and Senadheera [12], [19]. Several studies showed changes of ferritin serum level after iron supplementation in daily and weekly group [14], [20], [21], [22]. Sipra *et al.* found that ferritin serum levels increased in both groups. Zamani *et al.* and Mukhopadhyay *et al.* study showed increasing level of ferritin serum in the daily group and decreasing level of ferritin serum level in weekly group.

Our study shows decreasing level in the mean of ferritin serum level before and after supplementation in both groups ($p = 0.001$); however, the level did not reach the minimum standard level of ferritin serum (12 ng/ml) [23]. Decreasing level of ferritin serum was physiological due to the hemodilution process and high demands of the iron, especially in mid-trimester of pregnancy [24].

However, a recent study found that pregnant women in all trimesters had low level of ferritin serum [25]. The limitation of our study is small number of subjects that is being analyzed due to the geographical factor of area where most of them live in fishing villages that have limited access to the clinic. The other obstacles are the loss of communication for continuous evaluation and lack of family supports.

Conclusion

In our study, we found that weekly iron supplementation was as effective as daily iron supplementation in non-anemic pregnant women. Therefore, the regimen can be recommended to improve the compliance (medical adherence) of the patients, especially in coastal region. The iron supplementation should be continued during breastfeeding period to restore iron loss during pregnancy.

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