The Effect of Guava Extracts on Ferritin Levels in Pregnant White Rats

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ABSTRACT
Background: Anemia affects almost a quarter of the world population. Iron deficiency is a cause of anemia. Pregnant women are declared to have anemia when using the 11g / dL limit in the first and third trimesters and 10.5 g / dL in the second trimester while ferritin acts as an iron reserve. Guava is a source of vitamin C, one guava fruit contains four times vitamin C. The role of vitamin C in the process of absorption of iron helps reduce ferriiron to ferro. The aim of the study is to determine the effect of guava extract on ferritin levels in pregnant rats.

Methods: This type of research is experimental with a Post-test only design approach. The number of samples consisted of 36 pregnant white rats divided into 4 groups, namely the control group and 3 treatment groups I, II, III, each of which was given an oral volume of 1%, 2%, 3% guava extract.

The research was carried out at Andalas University Pharmacy Laboratory and Biomedical Laboratory. Ferritin levels by using the ELISA method. Statistical tests using the Kruskal Wallis along with the Mann-Whitney test.

Result: The results of this study indicated that there was a significant difference in ferritin levels between the control group and the treatment group p = 0.001 (p < 0.05).

The average ferritin level in the control group was 0.90956μg / mL, while the treatment group I was 1.57800μg / mL, and the treatment group II was 1.78578μg / mL, then the treatment group III was 1.92767μg / mL. Conclusions: There is an influence in giving guava extract to ferritin levels in pregnant rats.

Keywords: Guava extract, Ferritin levels

1. INTRODUCTION
In Indonesia, the prevalence of anemia occurs in 37.1% of pregnant women, 36.4% happens in pregnant women in urban areas and 37.8% follows in pregnant women in rural areas.[1]

According to the health data of the city of Padang, cases of anemia fell in 1968 people from 18511 pregnant women.[2] Iron deficiency is considered to be the most common cause of anemia. The cause of iron deficiency comes from prolonged negative iron intake, inadequate absorption or iron intake, increased iron requirements during pregnancy or growth, and increased iron deficiency due to menstruation.[3]

Iron (Fe) is very important for erythropoiesis, it is contributing to the production of hemoglobin in the final stages of erythrocyte differentiation. About 200 billion new red blood cells are produced every day, requiring 20-25 mg of Fe. Excess iron is stored in the body as ferritin. Ferritin molecules are hollow protein cells (outer diameter 12-13 nm, in 7-8 nm).[4][5]

The role of vitamin C in the process of absorption of iron is to help reduce ferriiron (Fe3+) to ferro (Fe2+) in the small intestine so that it is easily absorbed. This reduction process will be even greater if the pH in the stomach becomes more acidic. The content of vitamin C in guava is 87 mg / 100 g of vitamin C. The results showed that one guava (Psidium guajava) contained about four times the amount of vitamin C. Guava leaf extract is useful for antibacterial activity because it
contains flavonoids glycosides, Morin-3-O-alpha-L-lyxopyranoside and morin-3-O-alpha-L-arabopyranoside. In one guava, it was found about sixteen types of carotenoids in the red guava and thirteen parts of the meat were found as carotenoids which function for antioxidant activity.[6]

2. RESEARCH METHODS
The type of this research is experimental with the design of the Post-test Only Control Group. This research lasted for 4 months at the Pharmacy Laboratory, Faculty of Pharmacy and Biomedical Laboratory, Faculty of Medicine, Andalas University, Padang.

2.1 Guava Extract
500 grams of simplicia powder was added with 3.5 L of 70% ethanol liquid, then close and left it for 5 days. After 5 days, the mixture of simplicia and 95% ethanol was sealed so that filtrate (macerate) I. Dregs added 1.5 L of 95% ethanol as much as 3% closed and left for 5 days, protected from light while stirring occasionally. After 5 days, the mixture of dregs and 70% ethanol was reconstructed and the filtrate (macerate) II was obtained. Filtrate I and II were then mixed and concentrated using a rotary evaporator at 5°C until a thick ethanol extract was obtained. The sample was divided into 4 groups, consisting of the control group and the treatment group, each of which was given an oral volume of 1%, 2%, and 3% of guava extract.

2.2 Animal
Pregnant female white rat (rattusnorvegicus) weighing 200-250 grams. The number of samples is 36 rats.

2.3 Procedure
Rat blood was taken through retro orbitals by inserting a 2 cm capillary tube into the branch of the ophthalmic vein located in the orbital medianusorbitalis. Next, do the centrifugation at room temperature at a speed of 3000 rpm for 15 minutes. The next step was examined ferritin levels measured using the Enzyme Linked Immunosorbent Assay (ELISA) kit method. To find out the normality of the data, the Shapiro Wilk test was then carried out, then continued by Kruskal Wallis and to find out the differences in groups, the Mann-Whitney test was used. The results of data analysis showed that guava extract had an influence on ferritin levels.

3. RESULTS
This research lasted for 4 months at the Pharmacy Laboratory, Faculty of Pharmacy and Biomedical Laboratory, Faculty of Medicine, Andalas University, Padang. For the experimental group of treatment groups I, II, II each was given an oral volume of 1%, 2%, and 3% of guava extract. At ferritin levels p value is 0.000. This study can be concluded that there are significant differences among the control group towards treatment groups I, II and III who were given guava extract in pregnant white rats.

<p>| Table 1. Ferritin levels of pregnant rats in the control group and treatment group |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Ferritin Levels (µg/mL)</th>
<th>(Mean±SD)</th>
<th>(Min-Max)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>9</td>
<td>0.90956±0.06247</td>
<td>(0.781-1.210)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment I</td>
<td>9</td>
<td>1.57800±0.18255</td>
<td>(1.129-2.334)</td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Treatment II</td>
<td>9</td>
<td>1.78578±0.29949</td>
<td>(0.935-3.539)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment III</td>
<td>9</td>
<td>1.92767±0.26270</td>
<td>(1.333-4.091)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that there are significant differences among the control groups towards treatment groups I, II, and III. However, the results of the influence between treatment groups had no significant differences.
Table 2. The Result of Guava Extracts in Mann Whitney Test against Ferritin Levels in Control Groups and Treatment Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Control</th>
<th>Treatment I</th>
<th>Treatment II</th>
<th>Treatment III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>0.001*</td>
<td>0.001*</td>
<td>0.001*</td>
</tr>
<tr>
<td>Treatment I</td>
<td>0.001*</td>
<td>-</td>
<td>0.931</td>
<td>0.258</td>
</tr>
<tr>
<td>Treatment II</td>
<td>0.001*</td>
<td>0.931</td>
<td>-</td>
<td>0.387</td>
</tr>
<tr>
<td>Treatment III</td>
<td>0.001*</td>
<td>0.258</td>
<td>0.387</td>
<td>-</td>
</tr>
</tbody>
</table>

*There are significant differences (p <0.05)

4. DISCUSSION

Based on the results of the study, guava extract on ferritin levels showed a significant difference between the control group and the treatment group p = 0.000 (p <0.05). Ferritin is an Iron storage protein consisting of a protein shell with a molecular mass of about 500 kDa consisting of 24 sub-units. The protein shell encloses the ferry-hydroxyporphosphate nucleus which can hold up to 4,000 iron atoms.[7]

The results of this study are in line with the research by Padhya Haninda Nusantri Rusdi on the Effect of Giving Red Guava Juice (Psidium Guajava. L) on the Hemoglobin and Ferritin Levels of Serum in Young Women with Anemia. Data analysis using t-dependent test with significance level p = 0.05. The mean Hb pretest levels were 10.26 gr / dl (control) and 10.50 gr / dl (intervention), mean serum ferritin levels 33.63 µg / L (control) and 36.63 µg / L (intervention). The mean posttest Hb level was 10.98 gr / dl (control) and 12.48 gr / dl (intervention), the mean serum ferritin level was 40.35 µg / L (control) and 57.40 µg / L (intervention). The results of statistical tests showed that there was an effect of giving red guava juice to serum hemoglobin and ferritin levels in anemia patients of young women with a value of p = 0.001.

Ferritin stores iron which can be taken back to be used as needed. In conditions of excess iron, the body stores iron in the liver and spleen, ferritin contains 23% iron and apoferritin has a molecular mass of 440 kDa. Ferritin consists of 24 subunits of 18.5 kDa, encircling 3000-4500 iron atoms in the form of micelles. Under normal circumstances, ferritin is only slightly present in plasma.[8]

Increased iron needs during pregnancy are used for fetal and placental development and maternal health. Ferritin as iron reserves plays a major role in maintaining iron balance in the body when iron in the blood decreases. If pregnant women do not consume iron regularly and do not consume foods that accelerate iron absorption will result in iron deficiency anemia characterized by hemoglobin levels and decreased ferritin levels. Ferritin is present in epithelial cells that will be released by the body as iron reserves. If the iron level is high, the excess iron is removed from the blood into the intestinal epithelial cells in the form of ferritin. Ferritin will persist for three days because epithelial cells containing ferritin are released during mucosal regression.[9][10]

When ferritin decreases, the production of hemoglobin will decrease due to lack of iron as the main compartment in the formation of hemoglobin. The study of the Maternal and Cord Blood Hepcidin Concentrations in Severe Iron Deficiency Anemia with the results of mean Hemoglobin, serum iron, and serum ferritin from maternal anemia was significantly lower than nonanemic mothers in cord blood (p = 0.001). Serum iron and ferritin concentrations in severe iron deficiency anemia are 6.718 mmol / L and 4.11.4 mg / L in maternal blood, and 9.526 mmol / L and 55.419.7 mg / L in cord blood, respectively, significantly lower than nonanemic controls (p = 0.001).[11]

5. CONCLUSION

Based on this study, it was concluded that there was the effect of guava extract on ferritin levels in pregnant rats.

REFERENCES


