Association between Lifestyle and Dietary Habit with Hemoglobin Level

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Keywords: lifestyle, dietary habit, hemoglobin

Abstract: The lifestyle and dietary habit often leads to a decrease in hemoglobin levels. This research aimed to determine the relationship between lifestyle and dietary habit with hemoglobin level in the college students of Faculty of Medicine, University of Sumatera Utara. The research was observational analytics study with cross sectional approach. The research was administered in Faculty of Medicine, University of Sumatera Utara, students of this Faculty as responden. Lifestyle and dietary habit data such as the habit of lifestyle as a vegetarian, the lifestyle of consuming coffee and tea, and also the lifestyle of consuming supplements were obtained from interviews using questionnaires. The hemoglobin level was measured by using a digital hemoglobinometer. The results of this research were showed that the percentage of students had hemoglobin levels <12 g/dL were more in the vegetarian group than non-vegetarians (40% VS 8%) and more in the student with consumption supplement than non consumption it (15 % VS 8 %) but less in the student with consumption tea/ coffe than non consumption it (9 % VS 10 %). This research found that there is a significant difference of hemoglobin level in the vegetarian group compared to non vegetarian group.

1 INTRODUCTION

Hemoglobin is a human body protein present in erythrocytes. Hemoglobin serves as a transporter of oxygen from the lungs to the tissues and transports carbon dioxide from tissue to lung for excretion. If the amount of hemoglobin decreases from the normal value can decrease daily activity of human (Hoffbrand et al, 2005). The amount of hemoglobin less than normal level is called anemia. Anemia was one of the health issues that occured in many teenagers, including the college students community in developing countries. There were other clinical manifestations caused by anemia, such as impaired growth, decreased intelligence, and decreased physical ability. Decreased intelligence affected the learning process of college students, those who suffered anemia had the problem of short-term memory .(WHO, 2005).

Low levels of hemoglobin can occur because of the bleeding, impaired nutritional intake, and reabsorption disorders of those nutrient substances

that formed hemoglobin (Hoffbrand et al, 2005). Impaired nutritional intake may occur due to dietary patterns. One of the dietary patterns that often leads to a decrease in hemoglobin levels is the vegetarian diet. One of the dietary patterns that often caused anemia was vegetarian diet. Vegetarian diet was a dietary restriction that did not consume meat at all, mainly or only consumed food from the plant (Craig et al 2009). Vegetarian diet tended to cause low intake of iron, vitamin B6, vitamin B12 (multivitamin) etc, comparing with omnivore diet (Fraser, 2009). The research before showed that the level of hemoglobin was found below the normal range in the female and male vegetarian communities (Gorczyca et al, 2013).

Being known, if the adequate intake was not followed by a good absorption could also cause decrease in hemoglobin levels. Absorption of nutrients forming haemoglobin can be disrupted due to obstacles by certain substances such as substances contained in tea. The research done by Fan (2016) showed a decrease in hemoglobin levels in the group

of respondents who have a habit of consuming tea (Fan, 2016).

Increased prevalence of anemia due to decreased levels of hemoglobin levels encourage people to consume supplements. The types of supplements consumed are those containing nutrients supporting the synthesis of haemoglobin such as iron supplements, and multivitamin supplements. Iron supplementation was one of the ways to overcome iron deficiency and decrease anemia prevalence (Fikawati, 2010).. The research done by Ahmed (2005) showed Iron and mulvitamin supplementation increased hemoglobin level and decreased anemia effectively to the primary school children (Ahmed et al, 2005).

Based on the above matter, this research aimed to determine the relationship between lifestyle and dietary habit with hemoglobin level in the college students of Faculty of Medicine, University of Sumatera Utara.

2 METHOD

The type of research used was observational analytics study with cross sectional approach. The research was administered in Faculty of Medicine, University of Sumatera Utara, with the college students of Faculty of Medicine, University of Sumatera Utara as the target population. Lifestyle and dietary habit data were obtained from interviews using questionnaires that have been tested for their validity and reliability. Lifestyle and dietary habit data that were assessed in this research showed the habit of lifestyle as a vegetarian, the lifestyle of consuming coffee and tea, and also the lifestyle of consuming supplements.

Blood sampling was done to know the hemoglobin level by using a digital hemoglobinometer. The level of hemoglobin was classified low if it was below 12 g / dL, normal if it was 12-15 g / dL, and high if it was > 15 g / dL (Hoffbrand et al, 2005). The research sample was the subject taken from an affordable population with consecutive sampling method. The approximate of minimum sample in this research was based on the sample size formula to test the one-sided hypothesis, which was 99 students. The research samples that met the inclusion criteria were as below:

Inclusion criterias:
1. Willing to be a research respondent.
2. No smoking.
3. Not after menstruation at least 3 days before the examination.

4. Not after transfusing blood and donating at least 3 months.

Exclusion criterias for sample collection were:
1. Suffered from chronic infectious diseases diagnosed by a doctor (such as tuberculosis).
2. Suffered from diseases that were related to blood disorders diagnosed by a doctor (such as Thalasemia).

The relationship between variables was analyzed bivariately with chi square test with significance level (α) of 5%.

3 RESULTS AND DISCUSSION

The characteristic of respondent's gender in this research could be seen in Table 1.

Table 1. The characteristics of gender.

	n	%
Male	35	35,4
Female	64	64,6
Total	99	100,0

From the table above, it could be seen that most respondents was female group with the total of 64 people (64,6%).

The classification of hemoglobin could be seen in table 2.

Table2. The classification of hemoglobin

Hemoglobin	n	%
<12	10	10,1
12-15	69	69,7
>15	20	20,2
Total	**99**	**100,0**

In table 2 it can be seen that the hemoglobin level in the respondents of this study is much on the normal value that is between 12-15 g / dL (69 people / 69.7%).

Results of the habit or lifestyle and dietary habit on the respondents can be seen in table 3

Table 3. Frequency Distributions by Lifestyle and dietary habit

Consumption		n	%
Vegetarian	Yes	5	5,1
	No	94	94,9
Tea/ coffee	Yes	53	53,5
	No	46	46,5
Suplement	Yes	20	20,2
	NO	79	79,8
Total		99	100,0

In Table 3. It could be seen that the respondents who had vegetarian habits only 5 people (5.1%) while the remaining 94 people (94.9%) did not have that habit. This was in contrast with the respondents who liked to consume tea or coffee, most of the respondents were 53 people (53.5%) who liked to consume and 46 people (46.5%) who did not like. The respondents data who consumed supplements only 20 people (20.2%) who had that habit, while 79 people (79.8%) did not.

The relationship between vegetarian habits and hemoglobin level of this research respondent could be seen in Table 4.

Table 4. The Relationship of between vegetarian habits and hemoglobin level

Hemoglobin	Vegetarian	Non Vegetarian	p Value*
< 12	2	8	0,003
12 – 15	3	66	
> 15	0	20	
Total	5	94	

*chi square

From Table 4. it could be seen that there were 2 college students (40%) who had vegetarian habits and hemoglobin levels below 12 g/dL, while the remaining 8 (8 %) did not have vegetarian habits and their hemoglobin level were below 12 g / dL. Then, between the hemoglobin levels of 12 - 15 g / dL, there were 3 people (60 %) who had vegetarian habits and 66 people (70 %) who did not. There was not any person with vegetarian habit in the group of hemoglobin level with more than 15 g / dL, there were 20 (22 %) non-vegetarians. Analysis with chi square test showed significant difference of hemoglobin level in the vegetarian group compared to non vegetarian group with $p < 0,05$

This research result is similar to the research result done by Gorczyca (2013) to the vegetarian and non-vegetarian communities in Poland (Gorczyca et al, 2013). Similar results were also shown in a research conducted by Yen (2008) to a group of vegetarian children (Yen et al, 2008). A research conducted by Mahajani and Bhatnagar (2015) showed that the average hemoglobin level in non-vegetarian groups were higher the vegetarian groups (12.07 ± 1.08 g / dl VS 10.09 ± 0.95 g / dl). The intake of iron, protein, multivitamins, folic acid, and other nutrients to form hemoglobin were lower in the vegetarian groups than the non-vegetarian groups ((Mahajani & Bhatnagar , 2015)

A vegetarian diet is a diet pattern that did not consume animal products. Vegetarians could cause the nutritional needs including nutrients that formed hemoglobin were not met adequately which resulting to anemia. One of the lowest intake of nutrients in the vegetarian community was iron (Pawlak and Bell, 2017). The research conducted by Istiqomah in 2009 to the male of vegetarians in Semarang city got the result that only 60% of the research subjects had less iron intake(Istiqomah, 2009).

Low iron intake in vegetarian adolescents could be caused by the iron from the food they consumed was a type of non-hem iron. Non-hem iron had iron and bioavailability which was relatively lower than that contained in food sources of hem iron. Iron hem could be absorbed several times more than non-hem iron. Heme iron absorption could achieve 25%, while non-hem was only 5%. Consumption of hem iron and non-hem iron if done together could increase iron absorption hem (Wang et al, 2011).

The relationship between the habit of consuming tea or coffee and hemoglobin level in this research could be seen in table 5

Table 5. The Relationship between Hemoglobin Level with Tea or Coffee Consumption

Hemoglobin	Consumption Tea/Coffee	Non Tea/Coffee	p Value*
< 12	5	5	0,120
12 – 15	33	36	
> 15	15	5	
Total	53	46	

*chi square

Table 5 showed that the number of respondents with hemoglobin level below 12 g / dL who

consumed tea or coffee that contained caffeine were 5 people (9 %). It was the same with those 5 people (10 %) in the group who did not consume tea or coffee. Respondents with hemoglobin level between 12 - 15 g / dL were 33 people (62 %) who consumed tea or coffee and 36 people (78 %) did not consume. While 15 respondents (28 %) who consumed tea or coffee containing caffeine had hemoglobin levels more than 15 g /dL, 5 people (10 %) who did not consume tea or coffee. Chi square test was done to see the association of hemoglobin level between the people who consumed tea or coffee and those who did not consume tea or coffee obtained no significant relationship with p value of 0.120 (p> 0.05). This result was different from the research conducted by Septiawan &Sugerta (2015) (Septiawan & Sugerta, 2015)

Tea and coffee were very popular drinks in the world. Being known that the habit of consuming tea and coffee with other foods at the same time caused lower iron absorption from the food eaten. The concentration of tannin in tea and coffee were the factors that inhibited the absorption of iron in food. The tannin compound which was a polyphenol which could inhibit the absorption of iron by binding it (Ma, et al, 2011; Kim et al, 2008). Tea and coffee could also increase the acidity of the stomach, decrease gastric pH could increase the solubility of iron. The differences in the results of this research with studies showing the association of hempglobin levels with tea and coffee habits might be attributable to consumption patterns and coffee was not done at the same time as consuming other main meals (not together with breakfast time, lunch and dinner. In addition, in this study also not examined the type of respondents consumed whether the black tea or other types.

The relationship between the habit of taking supplements that contained iron and or multivitamin with hemoglobin level in this research could be seen in table 6

Table 6. The Relationship of Consumption supplements with hemoglobin level

Hemoglobin	Consumption Supplement	Non Supplement	p Value*
< 12	3	7	0,163
12 – 15	15	54	
> 15	2	18	
Total	20	79	

*chi square

Table 6 showed that the number of respondents with hemoglobin level below 12 g / dL consumed supplements that contained iron and / or multivitamin were 3 people (15 %) while those who did not consume were 7 people (8 %). Respondents with hemoglobin level between 12 - 15 g / dL who consumed supplements that contained iron and / or multivitamin were 15 people (75 %) while those who did not consume were 54 people (68 %). Respondents with hemoglobin level above 15 g / dL were only 2 (10 %) who took supplements that contained iron and / or multivitamin, while the remaining 18 people (23 %) did not take them. Chi square test was done to see the association of hemoglobin levels in between the people who had the habit of taking supplements compared with those who did not consume had no significant relationship with p> 0.05

Iron supplementation and multivitamins were one of the ways to overcome iron deficiency and reduce the anemia prevalence (Peyrin-Biroulet et al, 2015; Auerbach, M., and Adamson, 2015). In addition, iron supplementation and multivitamins could promote growth in preschoolers children and school-aged children with anemia (Ahmed, 2005)). In this research, we tested the variables of hemoglobin level correlation with consumption of supplements on the respondents. It was done to consider the respondents in this research were the students of medical faculty who understood the benefits of supplements for the body health. Consuming iron supplements and multivitamins for students in the medical faculty was a lifestyle to support the density of daily activities. In this research the percentage of low hemoglobin levels was less common in the group of students who took supplements than did not consume supplements. But statistical analysis did not show any significant relationship. This result was different from that of Zulaekah (2009) which showed that iron supplementation and multivitamin in primary school children effectively increased hemoglobin levels and decreased anemia by a meaningful association ((Zulaekah, 2009). The insignificant differences in the results of the present research were made possible because of the low number of samples and the nutrient intake of main nutrients not analyzed in this research

4 CONCLUSIONS

This research found that there is a significant difference of hemoglobin level in the vegetarian group compared to non vegetarian group. The relationship between the habit of consuming tea or

coffee with hemoglobin level showed no association and the same result in the habit of taking supplements

ACKNOWLEDGEMENTS

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