Factor Analysis of Lipid Profile in Early Adulthood with Inappropriate Food Consumption Habit: Screening Approach Dyslipidemia Induce Atherogenesis Acceleration

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Abstract. Dyslipidemia is a risk factor for cardiovascular disease through atherogenesis induction. The productive age of early adulthood today has different eating habits in relation to increasing culinary lifestyles and food hunter habits. In general, dyslipidemia rarely causes early phase symptoms. We suspect that there is an increase in the group with impaired lipid profiles related to dietary habits that do not pay attention to the essential needs of eating. The collected serum was carried out using a venous puncture procedure on 45 early adult subjects (men n = 9; women n = 36) aged 19-27 years in Malang City. The lipids were analysed for lipid profiles including TC, TG, HDL-c, and LDL-c. The results of men respondents showed higher differences in the lipid profiles of TC (p = 0.000), TG (p = 0.001), and LDL (p = 0.000) than women while HDL-c levels (p = 0.010) in women had higher differences than men. Dumpling (contains noodles and beef) has positive correlation with TG, TC, and LDL. At least in this study, we found that men in early adult had a higher lipid profile compared to women. This is of course related to diet have an impact on increasing lipid levels. For this reason, it is advisable to maintain a more productive eating habits to reduce the risk of dyslipidemia.

1. Introduction

Cardiovascular disease (CVD) is still the highest contributor to death in the world [1]. An estimated 17.9 million people died from CVD in 2016 which is representing 31% of all global deaths [2]. Over the years, the prevalence of CVD is definitely increasing. It is not only for the aged population but by the time this disease has also attacked many young people in their productive age. There are many factors that cause high lipid levels and one of them is an unhealthy diet. The body needs food to produce
energy. But in reality, nowadays eating is no longer just a necessity for energy fulfilment but has developed into a lifestyle. It is this lifestyle change that is responsible for CVD risk. This has an impact on lipid levels which will affect vascular performance. The unhealthy lifestyle associated with dyslipidemia cases.

Evidence from clinical and epidemiological trials in humans suggests that dyslipidemia is one of the most important modifiable risk factors for cardiovascular disease [3–5]. Dyslipidemia is generally characterized by an increase fasting total cholesterol (TC), LDL cholesterol (LDL-C), and triglycerides (TG) levels, along with a decrease in HDL cholesterol (HDL-C) levels [6]. Foods that contain saturated fat can cause an increase in cholesterol [7]. Therefore, we suspect that an unhealthy diet affects the lipid profile in early adulthood. For this reason, we are trying to find the correlation between food consumption and lipid levels in the early adulthood group.

2. Materials and Methods
This research has been accepted by the Ethics Committee at the Faculty of Medicine, University of Brawijaya and is recorded at number 149 / EC / KEPK / 08/2020. After obtaining ethical approval, the study was carried out by providing explanations to respondents and ensuring that all respondents in this study had provided the given informed consent. Respondents aged 19-27 years with a sample selection using purposive sampling method of 45 people. The materials used in this study were a needle, holder, 70% alcohol cotton, sterile gauze, gloves, yellow vacutainer tube, tourniquet, plaster. Measurement of the lipid profile of the sample was carried out by taking 3 mL of blood serum to determine the amount of total cholesterol (TC), Low density lipoprotein cholesterol (LDL-c), high density lipoprotein cholesterol (HDL-c), and triglycerides (TG) using Cobas C 501. The working principle of this method is enzymatic colorimetry. The blood that has been stored in the yellow vacuum tube is then centrifuged for ± 15 minutes at a speed of 4,400 RPM after that we use the measurement tools (Cobas C 501) to know the lipids profiles. Data on eating habits were obtained by distributing questionnaires including personal data and the food menu consumed each week.

Statistical Analysis
The tabulated data was then analysed using the IBM SPSS 25 including the Spearman test to decide the relationship between lipid levels (total cholesterol, LDL, HDL, and triglycerides) and eating habits. We use non-parametric Mann Whitney U test to decide the mean difference in lipid levels between men and women.

3. Results
The lipid profiles of 45 early adulthood aged 19-27 years consisting of 9 men and 36 womans were assessed. Table 1 shows the demographic data of research respondents. These tables consist of variable that we observed. Of the 45 early adulthood, total cholesterol was the highest lipid profile with abnormal status (>200 mg/dL). In this research, most of sample is woman sex (80%) and followed by men sex (20%).

| Variables | N = 45 | % |
|-----------|--------|---|
| Sex       |        |   |
| Men       | 9      | 20.0 |
| Woman     | 36     | 80.0 |
| TC        |        |   |
Normal (<200 mg/dL)  9  20.0
Abnormal (>200 mg/dL)  36  80.0

**TG**

Normal (<150 mg/dL)  39  86.7
Abnormal (>150 mg/dL)  6  13.3

**HDL-c**

Normal (>50 mg/dL)  21  46.7
Abnormal (<50 mg/dL)  24  53.3

**LDL-c**

Normal (<100 mg/dL)  18  40.0
Abnormal (>100 mg/dL)  27  60.0

*TC: total cholesterol; TG: triglyceride, HDL-c: high density lipoprotein cholesterol; LDL-c: low density lipoprotein cholesterol*

**Table 2.** Eating Habits in Every Week

| Food Consumption    | Consumption Status in a Week (N=45 (%)) |
|---------------------|----------------------------------------|
|                     | Yes                             | No                        |
| Meatball            | 21 (46.6)                       | 24 (53.3)                 |
| Egg                 | 42 (93.3)                       | 3 (6.7)                   |
| Cilok*)             | 12 (26.7)                       | 33 (73.3)                 |
| Dumpling            | 24 (53.3)                       | 21 (46.7)                 |
| Soy sauce pork      | 12 (26.7)                       | 33 (73.3)                 |
| Soft drink          | 18 (40.0)                       | 27 (60.0)                 |
| Fried (more than 3) | 36 (80.0)                       | 9 (20.0)                  |
| Coffee              | 27 (60.0)                       | 18 (40.0)                 |
| Offal               | 3 (6.7)                         | 42 (93.3)                 |
| Ice cream           | 15 (33.3)                       | 30 (66.7)                 |
| Noodle              | 21 (46.7)                       | 24 (53.3)                 |
| Chicken             | 3 (6.7)                         | 42 (93.3)                 |
| Beef                | 15 (33.3)                       | 30 (66.7)                 |
*) Cilok is Indonesian food that made from starch powder and blend together in a small ball shape; looks like meatball but majority has no beef but sometimes they use it.

**Lipid Profile Stratification by Gender**

In this study, we found that men’s lipid profiles such as TC, TG, and LDL have high amount than woman we can figure it out in Figure 1. Several studies suggest that LDL cholesterol, total cholesterol, and triglycerides are parameters and usually use as an indicator of the risk of dyslipidemia [8,9]. It can be seen that in the research we have conducted, the men population has higher levels of LDL lipids, total cholesterol, and triglycerides when compared to levels in the woman group. Table 3 leads us to the difference between the mean.

**Table 3.** Comparison of Average Lipid Profiles

| Parameter | Men (N=36) | Woman (N=9) | p-value |
|-----------|------------|-------------|---------|
| TC        | 167.22 ± 19.43 | 228.67 ± 9.849 | <0.001*) |
| TG        | 95.22 ± 47.27  | 128.67 ± 28.23 | 0.001*) |
| HDL       | 50.11 ± 10.61  | 39.67 ± 2.00  | 0.010*) |
| LDL       | 112.44 ± 21.17 | 179.33 ± 11.69 | <0.001*) |

*) Statistic test using Mann Whitney U test.
**) TC: total cholesterol; TG: triglyceride, HDL-c: high density lipoprotein cholesterol; LDL-c: low density lipoprotein cholesterol

**Figure 1.** Overview of early adulthood lipid profiles for serum total cholesterol (TC), triglyceride (TG), high-density lipoprotein (HDL-c) cholesterol, and low-density lipoprotein (LDL-c) cholesterol in women (n = 36) and men (n = 9) with the Mann-Whitney U Test. Men respondents showed higher differences in lipid profiles such as TC (p = 0.000 *); TG (p = 0.001 *) and LDL-c (p = 0.000 *) while women had higher HDL-c levels than men (p = 0.010 *).
We give a questionnaire (not shown) to all respondents to describe their food consumption habits menus in a week. The food column provides items that consumed by the respondents include meatballs, eggs, peanut brittle, dumplings, soy sauce, soda, fried> 3 pieces, coffee, offal, ice cream, noodles, chicken, and beef. Our suspicion for the food menu items has a routine weekly consumption could affect the lipid levels of the group. Therefore, from here we try to prove the hypothesis of the relationship between the diet consumed correlating with lipid levels using the Spearman test.

From these data, a significant correlation was shown in several food items with total cholesterol levels. This level has a significant correlation with the limit of p <0.05, by looking at the direction of the correlation, either negative or positive. Negative here means that the correlation between these variables is the opposite. In the data we got, the meatball variable had a moderate negative correlation with a TC level of -0.519 **. This means showing the opposite relationship; if the consumption of meatballs increases, the TC level in the blood will decrease, and vice versa. The next negative correlation is shown in the beef variable which is indicated by the degree of correlation -0.151 **. This value shows that the consumption of beef is opposite to the presence of TC in the body. The other variables that show a positive correlation here are dumplings and offal. The two variables have a correlation which affects TC levels of 0.516 ** and 0.271 *. The correlation is classified as a weak positive correlation, while the
correlation between TC and dumplings has a moderate correlation to TC levels. In our study, dumplings and offal affect TC levels, the more they are consumed, the more TC levels in the blood. In this case, we consider dumplings as a food menu consisting of boiled noodles, spices, and fried dumpling crackers. This shows that high carbohydrate consumption in boiled dumpling noodles has a correlation with TC levels in the body.

Triglyceride (TG) levels have a positive correlation with several food variables, including eggs (0.432 **), dumplings (0.455 **), coffee (0.696 **), and beef (0.327 *). From some of these food items, if sorted in correlation strength, it is found that TG is correlated with coffee> dumplings> eggs> beef. A negative correlation is also shown in the noodle variable, which is -0.413 **. This shows that excessive noodle consumption does not increase TG levels in the blood in this study. Furthermore, we also correlated HDL levels with several food items. In this study, only two items had a relationship with HDL levels, namely coffee (-0.664 **) and noodles (0.443 *). The two variables have an opposite relationship. Coffee has a negative relationship with HDL levels; thus, coffee consumption can affect HDL levels in the body which makes it decrease in the amount in the blood. Unlike the case with noodles, a positive correlation actually occurs in this study. Noodles show a positive correlation, where noodle consumption is proportional to HDL levels in the body, if one increases, it will affect the increase in the levels of the other. Then, in addition to HDL, we also associated LDL cholesterol with these food items with the following results: (1) positive correlation was in the variables of dumplings (0.541 **), soy sauce pork (0.297 *), and offal (0.371 *); (2) negative correlation is found in the variable meatball (-0.477 **) and noodles (-0.330 *). From these two results, we found that LDL levels had a high correlation with dumplings. Other results also showed that meatballs and noodles affected LDL levels but in different directions (opposite). Thus, we can conclude that some of the food items we suspect do have a correlation with lipid levels in the body.

4. Discussion
In this study, we conducted a comparison of lipid levels in men and women to describe the differences in the two gender groups. Our results show that the levels of TG, TC, and LDL have higher levels than women. These results support earlier studies about the relationship between lipid profiles and hormonal differences between women and men that it is indeed the difference between estrogens and androgens that causes differences in lipid levels prior to cardiovascular manifestations [10]. Another study states that women have high estradiol levels so that cardiovascular levels in women are lower when compared to men [11]. Therefore, from the data we report, it can be said that susceptible men have a higher risk of cardiovascular disease than women in terms of high levels of TG, TC, and LDL in the young adult group.

Several studies have shown that lipid levels have a relationship with food consumption [6,12,13]. From our research, lipid levels have a significant relationship with foods with high levels of protein and fat, such as meatballs, dumplings, offal, and beef. Of the several foods mentioned, some of them are made from beef. In general, red meat (beef, pork, and lamb) has more saturated fat which is not good for the body than chicken, fish, and vegetable protein such as legumes. Saturated and trans fats can increase blood cholesterol and worsen the vascular state. Beef is a good source of protein for the body, but it becomes dangerous for the body if consumed in excess [14].

The types of drinks consumed by the respondents in this study included soda and coffee. Soft drinks are a combination of sugar water which is mostly balanced in acidity [15]. Apart from fizzy drinks, nowadays, coffee is one of the most widely consumed pharmacologically active drinks, and its consumption has become a routine part of daily life around the world [15,16]. A dose-response relationship between coffee consumption and total and LDL cholesterol was identified (p <0.01). Elevations in serum lipids were greater in studies of patients with hyperlipidemia and in trials of caffeinated or boiled coffee. That study using an experiment using filtered coffee showed very little increase in serum cholesterol. Consumption of unfiltered, but unfiltered coffee, increase serum total and LDL cholesterol levels [16–18]. From these studies, it turns out that the way coffee is served is very influential on a person's lipid levels. The way coffee is served is not carried out in research and is a
limitation of our research so that it can become a topic for further research. Excessive coffee consumption can trigger changes in lipid profiles.

From the research data we obtained, the average food consumption of respondents varies, which can be seen in Table 2. These variations indicate an unhealthy pattern of living as seen from the absence of a menu of fruits and vegetables consumed every week and only types of meat and noodles that dominate the food variations selected. This unbalanced diet is what we suspect is a factor in the high level of lipid profile in early adulthood, because a trendy lifestyle eventually causes dyslipidemia.

5. Conclusion
From our research, it turns out that there is a significant relationship between diet and lipid profile at early adulthood age. The lipid levels of men in our study showed higher levels than in women. Thus, we recommend that you immediately improve a healthy lifestyle, especially paying attention to the food intake you want to consume to reduce cardiovascular risk.

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