

Effect of Instant Coffee Consumption Duration on Low Density Lipoprotein (LDL) and Triglyceride Levels in the Community in Tanjung District, North Lombok Regency

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ABSTRACT

Long-term coffee consumption is thought to affect health, on blood fat levels such as Low Density Lipoprotein (LDL) cholesterol and Triglycerides. Knowing the effect of length of instant coffee consumption on Low Density Lipoprotein (LDL) and Triglyceride levels in the community in Tanjung District, North Lombok Regency. nalytic observation with a cross-sectional approach. Non-random sampling technique with a sample size of 30 respondents. Data analysis of one way anova test. Average Low Density Lipoprotein (LDL) levels in instant coffee consumers 1 year 175.5 mg/dl, 2 years 227.9 mg/dl, 3 years 296.2 and triglycerides 1 year 107.5 mg/dl, 2 years 165.8 mg/dl, 3 years 159.1 mg/dl. The results of the one-way anova test obtained a sig value of $0.006 \leq 0.05$ and triglycerides $0.007 \leq 0.05$. there is a significant effect of length of instant coffee consumption (1 year, 2 years, and 3 years) on Low Density Lipoprotein (LDL) and Triglyceride levels in the community in Tanjung District, North Lombok Regency. Where the longer the consumption of instant coffee, the higher the levels of Low Density Lipoprotein (LDL) and Triglycerides increased in the first year of instant coffee consumption, but decreased in the third year. This change may be influenced by body adaptation and other factors such as diet, physical activity, and health conditions.

INTRODUCTION

Blood contains 80% cholesterol which is produced consisting of 2 types, namely HDL cholesterol and Low Density Lipoprotein (LDL) cholesterol. When Low Density Lipoprotein (LDL) cholesterol is in excess in the blood, it will be deposited on the walls of blood vessels and form clots that can clog blood vessels, while High Density Lipoprotein (HDL) cholesterol, has the function of cleaning blood vessels from excessive Low Density Lipoprotein (LDL) cholesterol. In addition, there are triglycerides that form the result of food metabolism in the form of fat and also in the form of excessive carbohydrates and proteins that are not entirely needed as a source of energi (Ramadhani, 2016)

Coffee is one of the factors that cause cholesterol levels to rise. The content of kahweol and kafestol contained in coffee is a pentacyclic diterpene alcohol which has negative side effects if consumed excessively, namely as a causative factor of hypercholesterolemic. The age factor also affects the duration of coffee consumption, in addition to the excessive amount

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of coffee consumption also causes the cafestol content that enters the body to be more (Krispila, 2022).

Nowadays, coffee enthusiasts are increasing, which can be seen from the large number of people from young people to adults who spend their time just enjoying a cup of coffee in a coffee shop or in a coffee shop (Uhya., et al 2021). There are many types of processed coffee products. One of them is instant coffee, which is a type of coffee that goes through a spary drying process and then packaged so that when brewed it will not leave dregs, while tubruk coffee is made by boiling or brewing coffee powder with sugar without a filtering process, leaving dregs at the bottom of the cup(Sudiyarto., et al 2012). Therefore, there is a change in consumer behavior that used to consume instant coffee. Instant coffee provides ease of serving, a variety of flavors, and does not contain pulp. However, on average, instant coffee contains sweeteners that are strong enough to reduce the original taste and aroma of the coffee (Damayanti., et al 2023). The description above requires further study to determine the levels of Low Density Lipoprotein (LDL) and triglycerides on the effect of long consumption of instant coffee. The author is interested in conducting research on the effect of the duration of instant coffee consumption on low density lipoprotein (LDL) and triglyceride levels in the community in Tanjung District, North Lombok Regency because no previous research has been done and residents consume instant coffee every day.

MATERIALS/METHOD

This study used an Analytical Observation design with a cross-sectional approach. the respondents of this study were people who consumed instant coffee regularly in the Tanjung District of North Lombok Regency. the number of samples in this study were 30 respondents. The sampling technique in this study used purposive sampling.

RESULTS AND DISCUSSION

Table 1. Low Density Lipoprotein (LDL) and Triglyceride levels on consuming Instant Coffee for 1 year

No	Sample code	Gender	Age (Years)	Low Density Lipoprotein (LDL)	Triglyceride Levels
1	A1	L	23	113	115
2	A2	L	54	80	95
3	A3	L	57	114	113
4	A4	P	43	165	134
5	A5	L	36	98	96
6	A5	P	25	279	161
7	A7	L	55	317	72
8	A8	L	42	235	134
9	A9	L	44	164	94
10	A10	L	35	187	61
Highest level				317	161
Lowest level				80	61
Average level				175.2	107.5
SDT				79.91	30.28

Table 2. Low Density Lipoprotein (LDL) and Triglyceride levels on consuming Instant Coffee for 2 years

No	Sample code	Gender	Age (Years)	Low Density Lipoprotein (LDL)	Triglyceride Levels
1	B1	L	38	295	120
2	B2	L	39	239	115
3	B3	P	35	172	177
4	B4	L	40	148	127
5	B5	L	39	147	100
6	B6	L	23	200	168
7	B7	L	24	175	189
8	B8	L	29	343	204
9	B9	L	43	317	182
10	B10	L	36	243	276
Highest level				343	276
Lowest level				147	100
Average level				227.9	165.8
SDT				71.24	52.76

Table 3. Low Density Lipoprotein (LDL) and Triglyceride levels on consuming Instant Coffee for 3 years

No	Sample code	Gender	Age (Years)	Low Density Lipoprotein (LDL)	Triglyceride Levels
1	C1	L	25	288	110
2	C2	L	55	257	161
3	C3	L	42	443	167
4	C4	L	44	373	190
5	C5	L	35	251	171
6	C6	L	38	184	125
7	C7	L	23	254	204
8	C8	L	39	373	213
9	C9	L	40	251	115
10	C10	L	39	288	135
Highest level				443	213
Lowest level				184	110
Average level				296.2	159.1
SDT				77.082	36.80

Based on the results of the above research, the results of the examination of Low Density Lipoprotein (LDL) and Triglyceride levels with an average value of Low Density Lipoprotein (LDL), 1 year 175.2, 2 years 227.9, 3 years 296.2 and Triglycerides, 1 year 107.5 mg/dl, 2 years 165.8 mg/dl, 159.1 mg/dl.

Table 4. One Way Anova Test Result Data

	Mean Square	F	Sig
Between Groups	36805.300	6.345	.006
Within groups	5800.300		
Between Groups	10177.233	6.042	.007
Within groups	1684.333		
Total			

In the results of the one way anova test above obtained Low Density Lipoprotein (LDL) is 0.006 and Triglycerides 0.007 is smaller than significant $P \leq (\alpha) 0.05$, there is a significant effect. length of time consuming instant coffee on Low Density Lipoprotein (LDL) and Triglyceride levels in the Community in Tanjung District, North Lombok Regency.

Average Low Density Lipoprotein (LDL) levels showed an increase as the length of time consuming instant coffee increased. consuming instant coffee for 1 year, there was a value of 175.20 mg/dL, still at a high threshold. This increase has started to occur due to the consumption of 3-in-1 instant coffee which contains vegetable creamer, added sugar, and active compounds such as cafestol and kahweol. The saturated and trans fat content in vegetable creamer starts to interfere with lipid metabolism in the liver, leading to accumulation of Low Density Lipoprotein (LDL) cholesterol (Wang et al., 2016).

On consuming instant coffee for 2 years, the Low Density Lipoprotein (LDL) level increased to 227.90 mg/dL. The metabolic effects of consuming these substances become more pronounced. Biochemically, trans fats from vegetable creamer inhibit the expression of Low Density Lipoprotein (LDL) receptors in the liver, reducing cholesterol removal from the blood. Cafestol and kahweol also inhibit the action of the enzyme CYP7A1, which converts cholesterol into bile acids, so cholesterol is retained longer in the blood circulation (Loftfield E, et al, 2021).

The sharpest increase occurred in the 3-year group, with Low Density Lipoprotein (LDL) levels reaching 296.20 mg/dL, which already exceeds the safe limit and is clinically categorized as a high risk of cardiovascular disease. Statistical tests showed that the p value = 0.006 was smaller than $p \leq (\alpha) 0.05$, indicating that the duration of instant coffee consumption had a significant effect on Low Density Lipoprotein (LDL) levels. The longer the consumption, the greater the risk of increasing Low Density Lipoprotein (LDL).

Vegetable creamer is made from vegetable oils that undergo a partial hydrogenation process, producing trans fats that are stable but have adverse effects on lipid metabolism. Trans fats are known to increase Low Density Lipoprotein (LDL) levels and decrease HDL (good cholesterol) levels, and induce vascular inflammation (Loftfield E, et al, 2021). This occurs through biochemical mechanisms, where trans fats affect the expression of Low Density Lipoprotein (LDL) receptors in the liver and reduce the liver's ability to clear cholesterol from the blood. Trans fats also inhibit the activity of the enzyme lipoprotein lipase (LPL), which functions in the breakdown of triglycerides, thus contributing to the accumulation of lipids in the blood (Wang et al., 2016).

Average Triglyceride levels showed an increase with the length of instant coffee consumption. consuming instant coffee for 1 year, there was a value of 107.50 mg/dL. This value is still within the normal range, but is indicative of early exposure to 3-in-1 instant

coffee, such as added sugar. Biochemically, excessive sugar consumption will stimulate lipogenesis in the liver, which is the process of converting glucose into triglycerides, which are then released into the blood.

The average Triglyceride level of instant coffee consumption over 2 years increased to 165.80 mg/dL. This increase indicates that the consumption of sugar in instant coffee over a longer period of time amplifies the lipogenic effect. Clinically, these Triglyceride levels are close to the risk threshold for hypertriglyceridemia. The added sugar in 3-in-1 coffee consumed regularly causes the accumulation of triglycerides in the blood (Sadeghi, O., et al, 2021).

Consuming instant coffee for 3 years, Triglyceride levels decreased slightly to 159.10 mg/dL, but remained higher than the 1-year group. Despite the decrease, biochemically this still reflects the accumulated long-term effects of instant coffee consumption. The high sugar and creamer content in instant coffee still affects lipid metabolism. The statistical test results showed that the p value = 0.007 was smaller than 0.05, indicating that the length of instant coffee consumption had a significant effect on Triglyceride levels.

The increase in Triglyceride levels is most likely influenced by the added sugar content in 3-in-1 instant coffee, which averages 10-15 grams per sachet. Excessive sugar will undergo a lipogenesis process in the liver, resulting in triglycerides being released into the blood circulation (Stanhope, 2016). When consumed regularly in the long term, this process can result in hypertriglyceridemia (Sadeghi, O., et al, 2021)

Apart from creamer and sugar, instant coffee also contains natural compounds such as cafestol and kahweol, which are found in unfiltered coffee. These compounds contribute to elevated cholesterol levels by inhibiting the enzyme CYP7A1, a liver enzyme that converts cholesterol into bile acids. When CYP7A1 activity is suppressed, cholesterol tends to be retained in the blood (Sadeghi, O., et al, 2021). Research by Loftfield et al. (2021) stated that consistent consumption of cafestol may interfere with cholesterol regulation in the liver. Overall, 3 in 1 instant coffee contains several components that can interfere with blood lipid profiles, namely vegetable creamer containing saturated and trans fats that increase Low Density Lipoprotein (LDL) levels, added sugar increases Triglyceride levels through lipogenesis and cafestol and kahweol increase cholesterol metabolism in the liver.

In this study, Low Density Lipoprotein (LDL) and triglyceride levels have been measured based on the duration of instant coffee consumption. However, it should be noted that blood lipid levels can also be affected by various other factors outside of coffee consumption. Low-density lipoprotein (LDL) and triglyceride levels can be affected by daily food intake. Intake of saturated fat and excess sugar has been associated with increased levels of triglycerides and Low Density Lipoprotein (LDL) cholesterol. In one study, it has been mentioned that consumption of foods high in trans fat and added sugar can trigger dyslipidemia in the population (Putri et al., 2021).

In addition, physical activity can also affect blood lipid profiles. When physical activity is done regularly, an increase in HDL (good cholesterol) levels and a decrease in triglyceride levels can occur. In another study, it was found that moderate intensity physical activity for ≥ 150 minutes per week can significantly reduce triglyceride levels (Wijayanti & Sari, 2020).

Smoking and alcohol consumption have been reported to adversely affect lipid metabolism. Smoking can cause oxidation of Low Density Lipoprotein (LDL) which contributes to atherosclerotic plaque formation, while high amounts of alcohol can increase plasma triglycerides (Santoso et al., 2021).

Body mass index (BMI) has also been linked to triglyceride and low-density lipoprotein (LDL) levels. Central obesity can cause insulin resistance and increased hepatic

lipogenesis, leading to increased triglycerides and low-density lipoprotein (LDL) (Fadilah & Wulandari, 2022).

Genetics and age cannot be ignored either. Genetics influence a person's metabolic response to diet and lifestyle. As we age, hormonal and metabolic changes have been observed to contribute to increases in total cholesterol and Low Density Lipoprotein (LDL) (Rahmawati et al., 2023).

CONCLUSIONS

There is a significant effect between the length of time consuming instant coffee on Low Density Lipoprotein (LDL) levels and Triglyceride levels. where there is an increase in Low Density Lipoprotein levels from the first year to the third year of consuming instant coffee. while triglyceride levels have increased in the first and second years of consuming instant coffee.

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