

# Effects of Fasting on Every Monday and Thursday to Cholesterol Levels of Patients with Type 2 Diabetes Mellitus

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**Abstract** — Patients with type 2 diabetes mellitus (DM) who do not control their cholesterol levels properly can experience risks of various complications. To prevent the complications of the patients with type 2 DM caused by hypercholesterolemia, diet by fasting is important. Fasting on every Monday and Thursday following the Prophet Muhammad's tradition has potential to reduce the cholesterol levels of the patients.

This research used a quasi-experimental design with a pre-test and post-test control for a group. It was conducted in January to May 2016 in Kasihan, Bantul, Yogyakarta. Its Respondents consisted of 15 people in an experimental group who were given interventions to fast every Monday and Thursday for one month with a total sampling technique and 15 people in a control group with standard treatments. Next, the gained data were analyzed by using the Wilcoxon test and Independent T-Test with a significance of  $p > 0.05$ .

The results shown that the average cholesterol levels after the intervention was 189.87 mg/dl in the experimental group and 223.33 mg/dl in the control group. There were significant differences of the cholesterol levels between the experimental group and the control group before and after fasting.

Fasting on Mondays and Thursdays effectively can reduce the cholesterol levels of patients with type 2 DM. Therefore, nurses can advise patients with type 2 DM to fast on Monday and Thursday by certain guidance.

**Keywords:** *Fasting on Monday and Thursday, Cholesterol Levels, Type 2 Diabetes Mellitus*

## I. INTRODUCTION

An unhealthy lifestyle in a society can increase degenerative diseases such as diabetes mellitus (DM) [1]. In 2015, the number of DM patients according to global research data has reached 415 million people and is expected to increase in 2040 to be 642 million people. Type 2 DM has become one of major diseases as 87% -91% of the total population of diabetics, especially patients with type 2 DM ages 20-79 year old [2]. Moreover, the prevalence of type 2 DM especially in Special Region of Yogyakarta in 2014 amounted to 25,152 people.

DM is characterized by chronic hyperglycemia and affects metabolisms of carbohydrates, proteins, and fats [3]. Fats plays an important role in productions of several hormones and formations of cholesterol largely formed by the body itself, especially in the liver. Although cholesterol is important if excessive levels in the body is called high cholesterol (hypercholesterolemia) which can cause

complications such as cardiovascular disease and other metabolic diseases [4].

Poor and uncontrolled high cholesterol levels will gather and harden into plaques in the arteries that block blood flows [5]. DM complications are very dangerous. To help diabetics to control their diseases, In 2011 PERKENI (Indonesian Endocrinology Association) launched four pillars of diabetic care consisting of education, physical exercise, pharmacological interventions using Oral Hypoglycemic Agents (OHA), and dietary planning [6].

Among the four pillars created by PERKENI, diet planning is the main pillar. One of ways to plan the diet can be done by fasting. Weight loss and BMI during fasting caused by a decrease in the amount of food, especially the loss of lunch when the body is metabolically active and reduced calorie intake and supported by psycho-physiological well-being during fasting play an important role in increasing the maximum process for the utilization of lipids in the blood circulation that affects decreased serum total cholesterol and increased serum HDL-C levels. Fasting can contribute to weight loss and BMI as it decreases the amount of food, especially during lunch time when the body is metabolically active. [7].

The Prophet Muhammad also provided an example for Muslims to plan their diets by fasting on Monday and Thursday. This is in accordance with one of the following authentic Hadiths:

إِنَّ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ- كَانَ يَتَخَرَّى صِيَامَ الْإِثْنَيْنِ وَالْخَمِيسِ.

The Prophet *sallallahu alayhi wa sallam* used to give fasting choices on Monday and Thursday. "(HR. Nasai no. 2362 and Ibn Majah no. 1739).

In general, fasting has many benefits for the body. However, patients with type 1 diabetes are not recommended for fasting because they have very high risks of life-threatening complications. Patients with type 2 DM are safer for fasting for the patients with type 1 [8].

Based on results of a preliminary study conducted in December 2015 at Puskemas Kasihan 1 (Community Health Center), Bantul, Yogyakarta, the highest number of people with DM was found in January 2014-December 2015 in the work area of the Kasihan 1 Health Center in Hamlet Kasihan with 30 patients. Data at the Community Health Center also showed that 30 people with diabetes have cholesterol levels >155 mg/dl.

Therefore, researchers are interested in examining the effects of fasting on Monday and Thursday to the cholesterol levels in diabetics at Hamlet Kasihan, Bantul, Yogyakarta.

**II. METHOD**

This research is a quantitative study using a quasi-experimental research design with pre-test and post-test in a control group design. The population in this research was people with type 2 DM having inclusion criteria with cholesterol levels >155 mg/dl and age 20-65 year old at Kasihan Hamlet, Bantul, Yogyakarta. For the criteria: they are willing to be a respondent; they are Muslim; they are able to read and write; they are not fasting regularly Monday and Thursday; they have not been hospitalized in the past 3 months; they are not getting insulin therapy; and they are respondents who use Biguanid or other drugs and get lifestyle therapy.

Based on the data from the Kasihan 1 Community Health Center, it was found that in 2014 there were 30 people with type 2 DM in Hamlet Kasihan. Next, the sampling was done using a total sampling technique. After obtaining consent of the respondents by signing the informed consent, the researchers determined an experimental group by 15 people and a control group by 15 people. The first 15 people willing to do fasting were included in the experimental group, and the next 15 people willing to do fasting were included in the control group.

The researchers then conducted pre-test for the both the groups by measuring their cholesterol levels. The control group was only informed that the researchers would meet them in the next 2 weeks for monitoring and in a post-test after 1 month of the pre-test. For the experimental group, booklets containing guides when fasting on Monday and Thursday and log books (fasting diaries) were provided. Specifically, the booklet contains tips of fasting for DM patients that researchers used to control the patients. The validity of the booklet was tested by 3 experts, and it was assessed that the booklet met the standard.

Furthermore, the researchers intervened with the experimental group to ensure their fasting for 1 month. They often were controlled via SMS/telephone before fasting and when fasting to inquire about the contents of their logbooks, to remind and to monitor their fasting scheduled by the researchers.

This research used two phases of data analysis procedures, namely descriptive analysis and inferential analysis. The inferential analysis was used to analyze two interconnected data. The first step in data analysis was to test data normality using Saphiro-Wilk (respondent <50). Based on the results of the normality test, it could be known that the pre-test control and the experimental data were not normally distributed with a significance value <0.05 (p <0.05), while the control group and the experimental post-test data were normally distributed with a significance value > 0.05 (p > 0.05).

Based on the results of normality test data to determine differences of the cholesterol levels in the control and the experimental group before and after the intervention using the Wilcoxon test. Meanwhile, to determine differences of

the cholesterol levels in the experimental and control groups after the intervention was by using the Independent T-Test.

**III. RESULT**

**A. Respondent Demographic Characteristics**

Based on the data analysis of characteristics of the respondents the experimental group were who age between 50-65 year old with an average age of 57.20 year old. Meanwhile, in the control group is people who age around 41-65 year old with an average age of 54.67 year old. The classification of results in the table below showed that the average duration of DM in the experimental group was 4.53 years; meanwhile, the average duration of DM in the control group was 6.13 years (TABLE. I).

Based on data analysis of the total respondents: 30 respondents, it was found that data based on gender that dominated the experimental and the control group male with a percentage of 66.7%. Also, data based education level of the respondents in this research that dominated were respondents with junior high school education with a percentage of 40.0% in the intervention group and elementary education level in the control group with a percentage of 46.7%. In addition, Data based on work in both the groups were mostly entrepreneur with a percentage of 40.0%. The classification of the data showed that both the groups mostly had income with an average of less than Rp. 1,200,000.00 per month (66.7%) (TABLE. II).

In addition, based on the analysis of OHA (Oral Hypoglycaemic Agents), medicine that was mostly consumed by the respondents was Single Metformin (56.7%). Next, based on most consumed cholesterol medicine; it was Simvastatin (53.3%) (TABLE. III).

TABLE I. FREQUENCY CLASSIFICATION OF RESPONDENTS BASED ON DEMOGRAPHIC CHARACTERISTICS OF AGE AND DURATION OF DM PATIENTS

	Min	Max	Mean	SD	Mode
<b>Experimental</b>					
Age	50	65	57,20	5,017	55
Duration	2	13	4,53	3,482	3
<b>Control</b>					
Age	41	65	54,67	8,287	53
Duration	1	22	6,13	6,578	3

TABLE II. FREQUENCY CLASSIFICATION OF RESPONDENTS BASED ON GENDER, DEMOGRAPHIC CHARACTERISTICS, EDUCATION LEVEL, EMPLOYMENT, AND INCOME

Characteristics	Experimental Group		Control group	
	Quantity (n)	Percentage (%)	Quantity (n)	Percentage (%)
<b>OHA consumption</b>				
a. Glibenklamid	3	20	3	20
b. Metformin	8	53,3	9	60
c. Glibenklamid and Herbal medicine	1	6,7	-	0
d. Metformin and Glibenklamid	1	6,7	-	0
e. Metformin and Herbal	1	6,7	1	6,7
f. Metformin and Glimepiride	1	6,7	2	13,3
<b>Cholesterol medicine consumption:</b>				
a. Simvastatin	7	46,7	9	60
b. Herbal	2	13,3	1	6,7
c. Not consume cholesterol medicine	6	40	5	33,3
<b>Total</b>	<b>15</b>	<b>100</b>	<b>15</b>	<b>100</b>

TABLE III. FREQUENCY CLASSIFICATION OF RESPONDENTS BASED ON MEDICINES CONSUMED

		N	Median (min-max)	Average±s.b	p
	<i>post-test</i>	15	190,00 (147-239)	189,87±21,524	
<b>Control</b>	<i>pre-test</i>	15	198,00 (181-262)	210,73±29,548	0,460
	<i>post-test</i>	15	215,00 (160-307)	223,33±45,772	

TABLE IV. RESULTS OF ANALYSIS DIFFERENCES OF CHOLESTEROL LEVEL IN EXPERIMENTAL GROUP AND CONTROL GROUP BEFORE AND

Group	N	Median	Min	Max	Mean	S.D	p
<b>Experimental</b>	15	190,00	147	239	189,87	21,524	0,016
<b>Control</b>	15	215,00	160	307	223,33	45,772	

AFTER INTERVENTION

#### B. Differences of Cholesterol Levels before (Pre) and after (Post) Intervention in the Experimental Group

Based on the data analysis, it can be found that the results of the pre-test and post-test of the experimental group with  $p = 0.033$  showed a decrease of cholesterol levels, while the pre-test and post-test analysis for the control group with a value of  $p = 0.460$  did not have differences of cholesterol levels (TABLE .IV).

#### C. Differences of Cholesterol Levels between the and the Experimental Group and the Control Group after the Intervention

Based on the data analysis, it can be seen that cholesterol levels was  $p = 0.016$  after post-test, ant it indicated that there were significant differences of cholesterol levels between the

TABLE V. RESULT OF ANALYSIS DIFFERENCES OF CHOLESTEROL LEVELS BETWEEN EXPERIMENTAL AND CONTROL GROUPS AFTER INTERVENTION

Characteristics	Experimental Group		Control group	
	Quantity (n)	Percentage (%)	Quantity (n)	Percentage (%)
<b>Gender:</b>				
a. Man	10	66,7	10	66,7
b. Woman	5	33,3	5	33,3
<b>Education Level:</b>				
a. Primary school	5	33,3	7	46,7
b. Junior high school	6	40,0	2	13,3
c. Senior High School	4	26,7	4	26,7
d. College	-	-	2	13,3
<b>Employment:</b>				
a. Housewife	2	13,3	1	6,7
b. Driver	2	13,3	3	20,0
c. Entrepreneur	6	40,0	6	40,0
d. Civil Servant	5	33,3	5	33,3
<b>Income:</b>				
a. <1.200.000	10	66,7	10	66,7
b. 1.200.000-2.400.000	5	33,3	5	33,3
c. >2.400.000	-	-	-	-
<b>Total</b>	<b>15</b>	<b>100</b>	<b>15</b>	<b>100</b>

experimental group and the control group after the intervention by fasting on Monday and Thursday in the experimental group (TABLE. V).

#### IV. DISCUSSION

The results of post-test analysis of cholesterol levels in the experimental group were 189.87 mg/dL, and in the control group were 223.33 mg/dL. The results of the statistical test of the research showed that the value of  $p = 0.016$  indicated that there were significant differences of cholesterol levels between the experimental group and the control group after the intervention by fasting on Monday and Thursday. The differences of post-test results between the groups showed that the fasting is effective for reducing cholesterol levels. This result can be influenced by several factors: physiology of fasting, diet control, fasting guidance for Monday and Thursday, monitoring by log books, and following-up by telephone/SMS, respondent sports, drugs and herbs.

The fasting in this research was conducted by by restraining of eating and drinking for ±14 hours starting from sunrise to sunset (*Maghrib*). The Fasting was done on every Monday and Thursday in accordance with the following Hadith:

When the Prophet Muhammad was asked about fasting Monday and Thursday, he answered:

ذَلِكَ يَوْمَانِ تَعْرَضُ فِيهِمَا الْأَعْمَالُ عَلَى رَبِّ الْعَالَمِينَ فَأَجِبْتُ أَنْ يُعْرَضَ عَلَيَّ وَأَنَا صَائِمٌ

Meaning:

"Both of them are the day when the deeds of God (Allah) are presented. Therefore, I like it that when my deeds are brought to Him I am in a state of fasting. "(Narrated by Al-Nasai and al-Shaykh Al-Albani).

The time of the fasting in this research was conducted for a month (eight times of fasting). Beside being able to practice worship, the patients can also adjust their diet by reducing food intake containing fat and calories. According to Begum (2015), there is a change in a low-fat diet and a low-calorie diet during fasting so that there is an increase in the efficiency of fat utilization and a decrease in the level of Basal Metabolic Rate (BMR) reducing cholesterol levels. Next, low availability of acetyl-CoA and glycerol along with decreased dehydrogenase activity from pentose phosphate pathway will also reduce fat biosynthesis. Because components in the formation of cholesterol are reduced, the amount of cholesterol in blood circulation will also be reduced [8]. Mayes (2003) argued that fasting more than 8 hours can reduce the activity of HMG CoA enzymes in the liver, so it can reduce cholesterol synthesis. Furthermore, fasting also can inhibit LDL cholesterol taken through LDL receptors in cholesterol synthesis [9].

Fasting affects cholesterol levels in both men and women. Saada's research (2010) showed a significant decrease of cholesterol levels from 210 mg/dL to 183 mg/dL with DM, age 45-53 year old [10]. Furthermore, Begum's study (2015) showed a significant decrease of cholesterol levels from 173.57 mg/dL to 165.90 mg/dL [8]. It can be concluded that fasting on Monday and Thursday can reduce cholesterol levels without regarding the gender.

The second factor supporting in reducing cholesterol levels in this research was dietary regulation in the experimental group. Based on the their log book for the fasting, the diet in the experimental group changed as consumption of foods containing cholesterol was also decreased. According to Akhtaruzzaman (2014), Obeying for a controlled diet that is low in fat and cholesterol intake while fasting can optimize the reduction of cholesterol levels in the body [11].

Pattern of diet when fasting should be arranged. Research from Azizi (2013) showed that there was no effect of fasting to cholesterol levels if respondents only obey a healthy diet at the beginning of fasting. Meanwhile, at the end of the fasting, the respondents did not apply a healthy diet pattern, so it needed continuous monitoring of both the family and health workers during fasting to control the respondents to remain compliant for the healthy diet [12].

The third factor that might influence the cholesterol reduction in the experimental group was provisioning fasting guidelines on Monday and Thursday. The respondents in the experimental group received booklets. The booklets used to guide patients with type 2 DM in the experimental group are to make them fast safely and reduce their cholesterol levels. The subjects of the booklet contain The subjects of the booklet contain some guidance like how to know Islamic teaching about fasting, how to determine blood sugar level, how to control blood sugar level, how to modify drug, how to modify exercise, and how to evaluate fasting.

Nilawati et al (2010) emphasized the need for education and information related to a healthy diet for diabetics so that several changes can occur [13]. Fasting guidelines on Monday and Thursday are expected to improve dietary behavior of the patients. According to Putra et al (2015), a person's behavior can be changed by providing knowledge

about health education. Moreover, the participation of health workers is also very important in changing the patient behavior [14].

The main topics in the booklet emphasized on how to modify diet containing explanations to avoid foods that can affect the cholesterol levels. According to LIPI (2009), the cholesterol can be controlled by reducing food intake that is high in saturated fat, trans fats and cholesterol [15].

The fourth factor affecting cholesterol reduction in the experimental group after the intervention was monitoring to determine the respondent behavior in the experimental group. In this research, the monitoring is done by using log books filled by the respondents for 1 month. The log book sheet contains about fasting or not, mealtime, meal menu, complaints when fasting, how to deal with complaints, menu when breaking the fasting, time to take medication and types of drugs and sports.

Diabetes monitoring is one of the management for people with DM beside other management such as diet, activity, and medication. In the context of the monitoring, the nurse's role is to assist the patients in monitoring their behavior such as diet or exercise patterns [16]. Observing the fasting log book, all the respondents in the experimental group had controlled themselves from eating foods with high saturated fat and cholesterol. According to LIPI (2009), to control cholesterol remaining stable, consumption of cholesterol foods should be no more than 300 mg every day [15].

The next factor influencing the results of this research was the role of assistance from researchers using communication via telephone/SMS. This can be seen from the fasting logbook that mostly all respondents in the experimental group did fast fully as scheduled in a month for this research. The fasting of the respondents was always controlled by researchers via telephone/SMS when the day before fasting and during fasting to ask about the contents of the log book, to remind and to monitor fasting scheduled by the researchers..

Assistance can improve dietary behavior that can affect the patient's cholesterol levels. According to Pranata (2015), provision of education and motivation can be provided by a telephone or SMS (Short Message Service) that programs and contents of the messages can be developed while still looking at the needs of patients [17]. The SMS was able to build awareness of DM patients about their illnesses, to improve self-management and to avoid complications [18].

The sixth factor that also support for the decrease of the cholesterol levels was sports practiced by the respondents. Monitoring the fasting log book, it can be found that 6 respondents in the experimental group did exercise 1-2 times a week. Changes of behavior by increasing physical activities are to improve the profile of fat in the blood. Exercise is very significant in the management of DM because it can reduce blood cholesterol levels and cardiovascular risk factors [6, 19].

The last, the decrease of cholesterol levels of the respondents in this research can also be influenced by consuming cholesterol drugs, namely Simvastatin drugs and herbal medicines. According to Harvey & Champe (2013), Simvastatin works by inhibiting the first enzymatic step in cholesterol making, namely inhibition of HMG CoA

reductase, so that cholesterol formation is inhibited [20]. The effects of the statin use were 21% consistent for reducing a vascular disease. This is a result of the pleiotropic effect of the statin, as a different mechanism of reduction in cardiovascular disease, from a decrease in their LDL [21].

In addition to simvastatin medical drugs, some respondents prefer to consume herbal medicines such as Sambiloto leaf and bay leaf. Consuming extract of bitter herbal water can prevent the increase of cholesterol levels. Extract of Sambiloto leaf water can inhibit the HMG-CoA reductase enzyme isolated from the liver. The constituent that may have acted as an inhibitor of the HMG-CoA reductase enzyme is andrographolide [22, 23].

To some extends, bay leaf that the respondents used have been analyzed by some researchers. For example, according to Indah (2015), there is an effect of bay leaf extract (*Eugenia polyantha*) in in reducing LDL levels in the blood due to contents of its flavonoids, namely quercetin which can reduce LDL levels, tannin which can inhibit absorptions of fats in intestines by reacting with mucosal proteins and cells intestinal epithelium, and saponins that will bind into complex bonds originating from food by increasing the binding of cholesterol by fiber so that cholesterol cannot be absorbed by the intestines [24, 25].

## V. CONCLUSIONS AND RECOMMENDATIONS

It can be concluded that there were differences of cholesterol levels between the experimental group and the control group after the intervention. The fasting on Monday and Thursday can be effective to reduce cholesterol levels of patients with type 2 DM. Nurses can advise DM patients to fast on Monday and Thursday by certain guidance. Furthermore, as a suggestion, future research can examine the effect of fasting on Monday and Thursday by other DM control parameters such as HbA1c, 2-hour PP Blood Sugar, and Fasting Blood Sugar.

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