The Effect of *Vikâla Bhojana* Fasting on Triglyceride and Plasma Glucose Level on *Theravâda* Monks

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Abstract
Introduction: *Heart disease and stroke are the top two causes of death in the world that are associated with high cholesterol and blood glucose level due to the wrong diet.*
Objective: *The objective of this study is to prove the effect of vikâla bhojana (Buddhist fasting) on triglyceride and fasting plasma glucose levels on Theravâda monks community in Medan city.*
Method: *The research method used is quasi experimental design with non equivalent control group. A purposive sampling technique with inclusion criteria has been applied to respondents, which consisted of 18 monks and 18 laypeople. Anthropometric measurements and biochemical blood analysis are used to collect data. Statistical analysis is performed by using a single sample t-test, unpaired t-test, and Pearson Product Moment.*
Result: *The research statistic shows the value of p=0,006 (p<0,05), indicating there is a significant difference between the mean of triglyceride and fasting plasma glucose level among groups.*
Conclusion: *Although the main purpose of vikâla bhojana (Buddhist fasting) is to attain self-control, vikâla bhojana (Buddhist fasting) can reduce triglyceride and fasting plasma glucose level.*
Keywords: *vikâla bhojana, triglyceride, fasting plasma glucose.*

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Pengaruh Puasa *Vikâla Bhojana* terhadap Kadar Trigliserida dan Gula Darah pada Komunitas Bhikkhu Theravâda

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Abstrak

Pendahuluan: *Penyakit jantung dan stroke merupakan dua penyakit pembunuh terbesar yang berkaitan dengan tingginya kadar kolesterol dan gula darah akibat pola makan salah.*

Tujuan: *tujuan penelitian ini adalah untuk membuktikan pengaruh puasa Buddhis (vikâla Bhojana) terhadap kadar trigliserida dan kadar gula darah puasa pada komunitas bhikkhu Theravâda di kota medan.*

Metode: *Penelitian ini menggunakan desain quasi eksperimental dengan kontrol grup yang tidak setara. Sampel diambil dengan teknik sampling purposive berdasarkan kriteria inklusi yang terdiri dari 18 orang bhikkhu dan 18 orang umat awam. Pengambilan data dilakukan dengan pengukuran anthopometrik dan analisa darah. Analisa statistik menggunakan uji t-test satu sampel, t-test tidak berpasangan dan Pearson Product Moment.*

Hasil: *Hasil statistik memperlihatkan nilai p = 0,006 (p<0,05) yang menunjukkan adanya perbedaan bermakna antara rerata kadar trigliserida dan gula darah puasa dua kelompok. K**esimpulan:** Walaupun tujuan utama puasa Buddhis (vikâla bhojana) adalah untuk mengendalikan diri, puasa Buddhis (vikâla bhojana) dapat menurunkan kadar trigliserida dan kadar gula darah puasa.*

Kata kunci: *vikâla bhojana, trigliserida, gula darah puasa.*

Introduction

The biggest cause of death in the world is cardiovascular disease.[1] More than 50% of them are directly related to diabetes. Currently, Indonesia is ranked number 7 among the top 10 countries with the highest number of diabetes sufferers in the world.[2] The most common type of diabetes in Indonesia is type II, which is very closely related to wrong diet and wrong lifestyle.[3,4] Consumption of low fiber and high glycemic index diet can increase the risk of type II diabetes.[5] Subjects who have high energy consumption levels have a 9.1 times greater risk of experiencing metabolic syndrome than subjects who have low energy consumption levels (OR = 9.1).[6]

Triglyceride is blood fat that tends to increase along with alcohol consumption, increase in body weight and consumption of high sugar or fat diet. An increase in triglyceride is a risk factor for coronary heart disease and stroke.[7] The increase in body mass index and waist circumference is influenced by the high-frequency intake of macronutrients, while the increase in the percentage of fat is associated with consumption of sugary drinks.[8] The largest number of respondents with high triglyceride level is found in 31-40 years old group, as many as 45.16%, followed by second largest in 51-60 years old group at 36.36%, and then 41-50 years old group at 20%.[9] Sugar and fats are very closely correlated to each other, like twin brother. People who suffer from diabetes can easily get hyperlipidemia, while people with high blood fats tend to get diabetes.[3] According to International Diabetes Federation (IDF) report in 2016, Indonesia still does not have action plans to overcome diabetes and reduce overweight and obesity.[10]

Many people in the world face untimely death due to over-eating. In Buddhism, fasting is an initial stage of self-discipline to acquire self control.[11] The Buddha advised monks not to take solid food after noon. *Vikâla bhojana* (Buddhist fasting) means to refrain from eating food at the wrong time, for example in the afternoon.[12] A *Theravâda* monk follows 227 precepts of *patimokha.* In *vinaya* regarding food,

it says "if a monk eat outside the specified period of time, he then violates the rules of *pâcittiya*".[13] There is no precept in the original Teachings of the Buddha that requires all Buddhists to be vegetarians.[11] The aim of this study is to prove the effect of *vikâla bhojana* (Buddhist fasting) on triglyceride and fasting plasma glucose levels on *Theravâda* monks community in Medan city.

Methods

This study was conducted in Medan city in March 2019, after receiving approval from the Health Research Ethical Committee, Medical Faculty University of Sumatera Utara (No.118/TGL/KEPK FK USU-RSUP HAM/2019). The research method used was a quasi-experimental design with non-equivalent control group.[14] The respondents consist of 18 people as the experimental group and 18 people as the controlled group. The experimental group was from Theravâda monks community who lived in several monasteries in Medan city, while the controlled group was chosen from Buddhists in Medan monasteries. The selection of respondents for purposive sampling method was made based on subjects meeting both inclusion and exclusion criteria. Inclusion criteria included men, aged 20-60 years old, non-vegetarians, currently not on any diet program, not on anti-cholesterol drugs, not on anti-diabetic drugs, not having history of hypothyroid, and be willing to take part in the research.

In the study, fasting blood samples were taken from the respondents, and biochemistry analysis was conducted in the regional health laboratory. The anthropometric assessment was conducted according to the standard procedure. Meanwhile, body weight was measured to the nearest 0.1 kg using a digital weighing scale, with respondents standing at upright position. Respondents were weighed without any shoes and with minimum clothing. Height was measured in an upright position to the nearest 0,1 cm using a microtoise staturmeter. Triglyceride serum and fasting plasma glucose were measured by photometer method by using Konelab 20Xti equipment.

Assessment of quality of vikâla bhojana (Buddhist fasting) uses Likert scale, with rating scores of 4. excellent, 3. good, 2. average, 1. poor. The scoring is based on the following indicators: 1. the time period of eating solid food. 2. the frequency of drinking sweet drinks. The diagnosis of diabetes is based on American Diabetes Association criteria, whereby in order to diagnose impaired fasting glucose, fasting plasma glucose level is between 100-125 mg/dL; for diabetes, it is e+126 mg/dL.[15] Triglyceride level is based on the National Cholesterol Education Program Adult Treatment Panel III criteria, whereby normal level is <150 mg/dL, borderline high is 150-199 mg/dL, high is 200-499 mg/dL, and very high is >500 mg/dL.[16]

The research variables consist of independent variables such as vikâla bhojana (Buddhist fasting), while the dependent variables include triglyceride and fasting plasma glucose level. The analysis of descriptive statistics on categorical scale data (such as Buddhist fasting) is presented in percentage format, while numerical scale data (such as age, height, weight, body mass index, triglyceride, and fasting plasma glucose level) is presented using mean and standard deviation.17 The analysis of descriptive data is done by using single t-test.

Statistical analysis used to determine the effect of vikâla bhojana (Buddhist fasting) include unpaired t-test, Pearson product-moment correlation coefficient, and simple regression. All statistical analysis was done using computing software, and data were processed statistically using 95% confidence level. For cases of non-normal distribution data ($p<0.05$), the data will be converted to logarithm numbers first before performing statistical analysis.

Result

The average score of Buddhist fasting quality from the experimental group is 8,472 or 84,72%, considered a good category (**Table 1**).

Table 1. The Quality of Buddhist Fasting

Indicator	Score	%	Category
The time period of eating solid food	9.792	97.92	Excellent
The frequency of drinking sweet drinks	7.152	71.52	Average
Average score	8.472	84.72	Good

The average age of the respondents is 35,4 ± 7,5 years old. The triglyceride level from both groups exhibits non-normal distribution. In addition, the fasting plasma glucose data from the experimental group shows normal distribution, while the controlled group shows non-normal distribution ($p<0.05$). The normality test for both groups is performed using the Saphiro-Wilk test (**Table 2**).

Table 2. General Characteristic Description of Two Group

Characteristics	Experimental Group	p	Controlled Group	p
Age (year)	33.83 ± 8.49*	0.336	37.17 ± 6.41*	0.999
Weight (kg)	58.57 ± 11.65*	0.175	75.11 ± 9.36*	0.853
Height (cm)	164.8 ± 7.18*	0.223	167.86 ± 4.76*	0.276
Body Mass Index (kg/m^2)	21.51 ± 3.99*	0.643	26.59 ± 3.13*	0.918
Triglyceride Level (mg/dL)	106 (62-186)**	0.028	154.5 (88-336)**	0.026
Fasting Plasma Glucose (mg/dL)	75.06 ± 7.86*	0.348	92.0 (59-225)**	<0.0001

Note: * Mean±SD, ** Median (min-max), Value of p<0,05 means non normal distribution data

Among all the respondents from each group, 14 respondents from experimental and 7 from controlled groups showed normal triglyceride levels. There are 4 and 5 respondents show borderline high triglyceride levels in experimental and control group respectively. Whilst no indication of high triglyceride level found in any respondent in the experimental group, six respondents from the controlled group were found with high triglyceride level (**Table 3**).

Table 3. Distribution of Triglyceride Level between Two Groups

	Experimental Group (N=18)		Controlled Group (N=18)		
Triglyceride (mg/dL)	n	%	n	%	Criteria
<150	14	77.8	7	38.9	Normal
150-199	4	22.2	5	27.8	Borderline high
200-499	-	-	6	33.3	High
>500	-	-	-	-	Very high
Total	18	100.0	18	100.0	

The fasting plasma glucose level of all respondents in experimental group exhibits normal range result. This is compared to 14 respondents in controlled group having normal range, while three subjects were found prediabetic and one was diabetic (**Table 4**). The homogeneity which is categorized under age, weight, height, and body mass index of the two groups is homogeneous as shown in **Table 5**. The value of p=0.006 (p<0.05) shows there is a significant difference between the mean of triglyceride level between two groups (**Table 6**).

Table 4. Distribution of Fasting Plasma Glucose between Two Groups

	Experimental Group (N=18)		Controlled Group (N=18)		
Fasting Plasma Glucose (mg/dL)	n	%	n	%	Criteria
<100	18	100.0	14	77.8	normal
100-125	-	-	3	16.7	prediabetes
≥126	-	-	1	5.5	diabetes
Total	18	100.0	18	100.0	

Table 5. Homogeneity of Two Groups

Homogeneity Test				
Characteristic	**Statistic test**	**Statistic Value**	**p**	**Criteria**
Age	F test	1.753	0.257	homogeneous
Weight	F test	1.550	0.375	homogeneous
Height	F test	2.270	0.100	homogeneous
Body mass index	F test	1..632	0.322	homogeneous

Table 6. Comparison of Triglyceride among Experimental and Controlled Group

Triglyceride Level	Mean ± SD	p
Experimental group (n=18)	2.047 ± 0.150	0.006
Controlled group (n=18)	2.202 ± 0.197	

Unpaired t-test

Table 7. Comparison of Fasting Plasma Glucose among Experimental and Controlled Group

Fasting Plasma Glucose Level	Mean ± SD	p
Experimental group (n=18)	1.873 ± 0.048	0.006
Controlled group (n=18)	1.957 ± 0.127	

Unpaired t-test

The value of p=0.006 (p<0.05) shows there is a significant difference between the mean of fasting plasma glucose level between the two groups (**Table 7**).

Table 8 shows correlation between *vikâla bhojana* (Buddhist fasting), triglyceride and fasting glucose plasma level. On the correlation between *vikâla bhojana* (Buddhist fasting) with triglyceride level, the correlation coefficient, r of -0.512, and p<0.05 indicates negative and moderate correlation which is statistically significant. On the correlation between *vikâla bhojana* (Buddhist fasting) with fasting plasma glucose level, the coefficient correlation, r of -0.120, and p>0.05 indicates negative and very weak correlation which is statistically not significant.On the correlation between triglyceride and fasting plasma glucose level, the coefficient correlation, r of -0.252, and p>0.05 indicates negative and weak correlation which is statistically not significant.

Table 8. Summary of Associative Hypothesis Testing

Correlated Variables	Correlation (R) Matrix	p	R	Regression Equation Squared
Buddhist fasting and triglyceride level (rxy_1)	-0.512	0.029	0.262	Y = 3.219 + -0.462(X)
Buddhist fasting and fasting plasma glucose level (rxy_2)	-0.120	0.633	0.014	Y = 1.961 + -0.035(X)
Triglyceride and fasting plasma glucose level (ry_1y_2)	-0.252	0.311	0.063	$Y_1 = 3.527 + -0.790(Y_2)$
				$Y_2 = 2.038 + -0.080(Y_1)$

Discussion

Buddhist fasting practice in *Theravâda* monks community in Medan is 84.72%, which is considered as good category. In addition, their triglyceride level in the same community is 118 mg/dL and this is considered as normal category; their fasting plasma glucose level is 75.06 mg/dL and is considered as normal category.

In this study, all respondents aged between 31-40 years old had high triglyceride level. This is in accordance with research conducted by Watuseke et al.[9] Buddhist fasting emphasizes the importance of the discipline of mealtime and so far there has been no research on this.

Our research shows statistically significant data with p<0.05 (p=0.006) whereby Buddhist fasting is able to reduce triglyceride level among *Theravâda* monks community in Medan. In addition, there is also statistically significant data with p<0.05 (p=0.006) to show that Buddhist fasting can reduce fasting plasma glucose level among *Theravâda* monks community in Medan.

Buddhist fasting is correlated to triglyceride level among *Theravâda* monks community in Medan with correlation coefficient of -0.512

with $p<0.05$ ($p=0.029$). This means that the higher or the better the Buddhist fasting score, the more significant the decrease in triglyceride level. The determination coefficient, r^2 of 0.262, shows that 26.2% of impact to triglyceride level among Theravâda monks community in Medan is determined by Buddhist fasting practices, while the remaining 73.8% is determined by other factors.

Buddhist fasting is correlated to fasting plasma glucose level with correlation coefficient of -0.120 with $p>0.05$ ($p=0.633$). Such a very weak correlation is due to the absence of prediabetic and diabetic cases among *Theravâda* monks community in Medan.

Triglyceride level is correlated to fasting plasma glucose level with coefficient correlation of -0.252 with $p>0.05$ ($p=0.311$). This means that when triglyceride level is high, the fasting plasma glucose level decreases and vice versa. This contradicts to the theory of positive correlation between plasma sugar and blood fat.[3] The result of such negative correlation in this research is due to the presence of borderline high triglyceride level but yet with the absence of prediabetic or diabetic cases among *Theravâda* monks community in Medan.

Conclusion

It is proven in this research study that Buddhist fasting can reduce triglyceride and fasting plasma glucose level among *Theravâda* monks community in Medan. It is worth to note that the original purpose of practising Buddhist fasting is to attain self control and not to focus on health benefits mentioned above.

Recommendation

Buddhist fasting can be widely practised in Indonesia as well as international community as a strategy to overcome diabetes and obesity. The result of this study can be the basic reference for further research and tested in other communities such as the *vipassanâ bhâvanâ* retreat whom practice Buddhist fasting in a certain period of time or for followers whom practice Buddhist fasting every *uposatha* day (1st, 8th, 15th , 23rd of the lunar month).

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