



Influence of *Intermittent Fasting* to Body Weight and Blood Glucose Levels in White Rats with Diabetes Mellitus Model

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Abstract. Diabetes mellitus is a metabolic disorder in the form of hyperglycemia caused by many factors. An intermittent fasting diet is a diet modification that can cause a decrease in adiposity which affects the increase in leptin and adiponectin sensitivity. This study aimed to determine the effect of average blood glucose levels in white rats with Diabetes Mellitus Model with intermittent fasting diet intervention compared to controls. The method is an experimental laboratory-only post-test group design. The research was conducted at the Animal House, Faculty of Medicine and Health Sciences, Jambi University, and the Jambi Provincial Health Laboratory. White rats (*Rattus norvegicus*) Wistar strain with diabetes mellitus model 2–3 months old and no anatomical abnormalities were divided into two groups: control (n = 10) which received an ad libitum diet, and intermittent fasting (n = 10) diet. Blood glucose levels were measured before and after treatment. Results Intermittent fasting diet can reduce weight in white rats with diabetes mellitus model (mean = 196.4) compared to the control group (mean 243.52), reduce blood glucose levels in white rats with diabetes mellitus model (mean pretest = 133.53, mean post-test = 113.47) compared to control (mean pretest = 103.68, mean post-test = 121.46) (Mann -Whitney test; p < 0.05). The conclusion is that intermittent fasting can reduce weight and blood glucose levels in white rats with diabetes mellitus model.

Keywords: Diabetes mellitus · intermittent fasting diet · weight · blood glucose level

1 Introduction

According to the Central for Disease Control, diabetes mellitus is experienced by 34.2 million people in the United States [1]. In Indonesia alone, the number incidence of diabetes mellitus continues to increase, in 2013 the number was about 21.3 million souls and by 2030, it is estimated that diabetes mellitus will be the reason 7th death in the world [2]. Destination treatment of diabetes mellitus is now directed to prevent or postpone

happening complications. Diabetes mellitus patients are recommended for to do change their style of life, increase activity physical, decline weight too therapy nutrition [1]. One possible dietary modification conducted to change style life as well as decline body weight in patients with diabetes mellitus, namely intermittent fasting. Intermittent fasting is diet modification with two periods eat, that is period fasting with only consuming food 20–25% time fasting, as well as period, eating like normal (*ad libitum*). Decline The weight gain that occurs in someone who does an intermittent fasting diet is also influenced by the role of leptin. Leptin plays a role in Settings weight with convey impulses to the hypothalamus for push intake eat and increase the expenditure of energy. Because that's it, someone with obesity and insulin resistance also experiences leptin resistance. An intermittent fasting diet can also cause a decline influencing adiposity and enhancement of leptin and adiponectin sensitivity [2].

Fasting diet intermittent trusted could help lower weight, reduce the risk of disease metabolic, as well capable reduce insulin resistance. However, not yet there is an effective period long from the fasting diet intermittent [3]. Research regarding the fasting diet intermittent could cause a decline in body weight, glucose, and insulin concentrations. However, in research, this has not yet been carried out on a sample with disease chronic, such as diabetes, disease cardiovascular as well as Alzheimer's [4].

2 Method

This research is a laboratory experimental design with only a post-test group design. Sample in research this, i.e., male white rat (*Rattus norvegicus*) Wistar strain with the Diabetes Mellitus model. The place implementation study, i.e., Animal House, Faculty of Medicine and Health Sciences, the University of Jambi, monitors and weighs body weight and the Jambi Provincial Health Laboratory to examine blood glucose levels.

The sample study has criteria inclusion, i.e., rat white (*Rattus norvegicus*) strain Wistar male with a 2–3-month-old model of diabetes mellitus. Body weight 200–250 g as well, no abnormality anatomy. There are dropout criteria on the sample research, that is, when dead during treatment research. The sample study shared into two groups, consisting of 10 tails rat white strain Wistar with a given model of diabetes mellitus Intermittent fasting diet treatment in the form of a fasting diet which is done two times a week (Monday and Thursday). 10 tails again, i.e., is the control group was given a composition diet in accordance needs and balance. Mouse weight was weighed every three days once, and retrieval blood was conducted before conducted treatment after a 1-month rat intermittent fasting diet. Taking sample blood was performed on the vessel's blood tail.

Results data weight and level glucose blood obtained conducted analysis univariate and bivariate. Achievement indicators, namely, weight gain/loss and rate blood glucose in mice white strain Wistar with the Diabetes Mellitus model given an intermittent fasting diet, differed statistically significantly.

Table 1. Distribution frequency of body weight in the control group and intermittent fasting in the rat model of diabetes mellitus

Group	Mean Value	CI95%	Min-Max	<i>p Value</i>
Control	253,0	224,84–282,35	196–299	0,004
Intermittent Fasting in Diabetes mellitus rats	196,4	180,41–214,58	153–238	

Analyzed with Mann Whitney u test, CI: Confidence Interval

Table 2. Distribution frequency glucose blood control group and intermittent fasting in the rat model of diabetes mellitus

Group	Mean Value	CI95%	Min-Max	<i>p Value</i>
Control	416,75	224,84–282,35	388–498	0,04
Intermittent Fasting in Diabetes mellitus rats	280	180,41–214,58	224–349	

Analyzed with Mann Whitney u test st, CI: Confidence Interval

3 Result

3.1 Measurement Weight Body

Fasting diet intermittent could lower rat white strain Wistar with diabetes mellitus model (mean = 196.4) compared to controls (mean = 253,0) (Table 1).

3.2 Results of Blood Glucose Measurements

There is a declining rate of glucose blood in the intermittent fasting diet group in rats white strain Wistar with diabetes mellitus model (Mean = 416, 75) compared control group (mean = 280). Based on the Mann Whitney statistical test ($p =$) noted that there is an effect of intermittent fasting diet on the rate of glucose blood rate white model diabetes mellitus (Table 2).

4 Discussion

The decrease in blood glucose was due to the fasting period on the intermittent fasting diet. Because blood glucose decreases, it will affect the body to carry out the process of gluconeogenesis, namely the breakdown of fat and protein as a source of energy. In the first 24 h of the intermittent fasting diet, there was already a breakdown of fat, while the study of protein, as seen by the discovery of urea nitrogen, occurred after doing the intermittent fasting diet for five days [3]. Besides causing a decrease in blood glucose, the intermittent fasting diet also decreases fat mass. This experiment occurs because of an increase in adiponectin and a decrease in leptin. Adiponectin functions to increase energy expenditure by binding to AMPK and activating peroxisome proliferators, which are PGC-1 α protein receptors. Decreased leptin can also lead to decreased fat mass [5].

In the fasting state, blood glucose will decrease. Intermittent fasting will lead to reduced insulin secretion and increased glucagon and catecholamines. The activation of glucagon causes glycogenolysis in the liver and increases gluconeogenesis. The breakdown of glucose in the muscles and lower plasma insulin levels will rise [6].

In a study by Maarten (2009) that compared the effects of intermittent fasting and a standard diet for two weeks with eight volunteers with a cross-sectional study design, it was found that there was no difference in body weight between the intermittent fasting and standard diet groups but peripheral glucose absorption and hepatic insulin sensitivity. Significantly different [7]. However, in a study conducted by Rafael and Mark (2019) on 16 people who did an alternate-day fasting diet for 22 days, it was found that there was a 2.5% decrease in body weight and a 4% decrease in fat mass and a 57% decrease in fasting insulin levels [8].

5 Conclusion

An intermittent fasting diet in rats with white strain Wistar model of diabetes mellitus could lower body weight and causes a decrease in blood glucose.

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