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Effectiveness of milk kefir administration with the addition of sorghum flour against total cholesterol levels, and blood glucose levels in obesity-induced mice

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ABSTRACT

Introduction: Someone who is overweight has the potential to experience complications from various diseases which become a heavy economic burden for the community. Dietary modification is considered as one of the strategies to prevent and handling obesity. It can be done by adjust the type, amount, frequency, processing methods, and schedule. Maintenance of intestinal microflora can be done by regulating food intake by consuming foods or drinks that have physiological functions for health. Synbiotics can control the number of good micro-flora in the digestive tract, thus providing health and therapeutic benefits. The aim of this study was to see the effectiveness of milk kefir plus sorghum flour on maintain the cholesterol and blood glucose levels of mice that have been fed a high-fat diet or induced obesity.
Methods: This type of research design is true experimental in vivo using a randomized controlled pre-test-post-test control group design. Based on the test results using one way ANOVA statistical test which can be seen, it can be concluded that there are differences in blood glucose levels in the treatment group using the COD-PAP method with a p-value of 0,031.
Results: According to ANOVA test, there are differences in total cholesterol levels in the treatment group using the CHOD-PAP method with a p-value of 0,000.
Conclusion: There are differences in blood glucose and total cholesterol levels in mice fed kefir milk with the addition of sorghum flour.

Keywords: *Total Cholesterol Level, Blood Glucose Level, Obesity, Milk Ke ir, Sorghum Flour.*
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INTRODUCTION

The obesity prevalence continues to increase in various parts of the country which is very important to be addressed immediately. Someone who is overweight has the opportunity for complications of various diseases, such as diabetes mellitus, osteoarthritis, cancer, kidney failure, heart disease, and asthma which become a heavy economic burden for the community.[1] In 2016, there were more than 340 billion children and adolescents aged 5-9 years, while in adults aged 18 years and over in the world more than 1.9 billion were overweight.[2] One of the managements of obesity to prevent obesity through diet modification is to regulate the diet, namely the type, amount, frequency, processing method, and schedule.[3] Maintenance of intestinal microflora can be done by regulating food intake by consuming foods or drinks that have physiological functions for health (Julianto et al, 2016). Synbiotics can control the number of good microfloras in the digestive tract so that they provide health and therapeutic benefits. Synbiotic drinks are drinks that contain prebiotics and probiotics with the addition of Lactic Acid Bacteria (LAB).[4]

Prebiotics in this study used kefir milk containing various cultures of lactic acid bacteria. Based on previous study, consuming kefir on daily basis can upregulate the the metabolic system, particularly on fat burning process which lead to weight loss.[5] While the probiotics in this study used sorghum flour which contains dietary fiber and resistant starch contained in sorghum which can be used by probiotic bacteria in the large intestine to grow and reproduce. Based on this summary, the researchers aimed to conduct research on the effect of milk kefir added with sorghum flour on body weight, appetite, liver, body fat around the abdomen (abdominal), serum lipid profile, and blood glucose in mice that have been given a high-fat diet or induced obesity with a study time of 8 weeks.

Based on the background described above, the purpose of this study was to analyze the effectiveness of giving milk kefir with the addition of sorghum flour (Sorghum bicolor (L) Moench) on the profile of total cholesterol and blood glucose in white mice (Mus musculus) which has been induced by obesity.

METHODS

Study Design

This study used a randomized controlled design (randomized experiment) pre-

test- post-test control group design. Pre-test design–post-test control group is a simple experimental study involving at least two groups, one is called the intervention, experimental, or treatment group and the other is called the control or comparison group. Then, the other group was given one level (intervention) of the independent variable. This study used 3 sample groups, consisting of one negative control group, one positive control group, and one treatment group. The samples used were 27 white mice that had been induced by obesity.

This study was true experimental in vivo using a randomized controlled pre-test and post-test control group design. The production of milk kefir with the addition of sorghum flour (Sorghum bicolor (L) Moench) was carried out at the Laboratory of Nahdlatul Ulama University Surabaya, as well as to examine lipid profile levels and blood glucose levels.

Data Collection

The population in this study were male Balb-C white mice (Mus muculus) with the age of 2 - 3 months and body weight of 25 - 40 grams, and in normal conditions obtained from the Animal Laboratory of the Faculty of Pharmacy, Airlangga University.

Data Analysis

Data analysis was performed During an ongoing investigation in progress to give details about the perspectives of various participants. This data analysis process includes the coding learning process, the resulting project student every time you look face and result in creativity art student in designing creation art following direction.

The sample inclusion criteria from this study, namely:

a. White mice (Mus muculus) type albino strata Balb-C.
b. Male.
c. Has a body weight of 25-40 grams.
d. Approximately 2-3 months old.
e. Normal behavior and activities.

The criteria for the exclusion sample from this study are:

a. Sick mice.
b. Mice do not have normal activities.
c. Mice die during adaptation.
d. Have visible anatomical abnormalities.
e. The body of the mouse has a wound or infection.

The sample drop-out criteria from this study, namely:

Test animals that die in the period between the first injection and before termination are considered dropouts.

RESULTS

Based on the results of blood glucose examination using the COD-PAP method

Prior to the previous statistical test, a normality test was carried out and the results showed that the types of data were normally distributed. It can be seen that all treatment groups were given normal feed, high fat diet feed and high fat diet feed and milk kefir added with sorghum flour which met the assumption of normality.

The next test using the one-way ANOVA statistical test which can be seen in Table 1, it can be concluded that there are differences in blood glucose levels in the three treatment groups using the COD-PAP method with a p-value of 0,031.

Furthermore, further tests were carried out using the Post-Hoc test statistical test, the results obtained were:

1. There is no difference in treatment between 1 and 2 using the COD-PAP method by looking at blood glucose levels, the p-value was 0.079
2. There is a difference in treatment between 1 and 3 using the COD-PAP method by looking at blood glucose levels, the p-value was 0.043
3. There is no difference in treatment between 2 and 3 using the COD-PAP method by looking at blood glucose levels, the p-value was 0.958

Based on the Results of Total Cholesterol Examination Using the CHOD-PAP Method

Prior to the statistical test, the normality test was previously carried out and the results showed that the types of data were normally distributed. It can be seen that all treatment groups given normal feed, high fat diet feed and high fat diet feed and milk kefir with sorghum flour met the assumption of normality.

The next test using the one-way ANOVA statistical test which can be seen in Table 2, it can be concluded that there are differences in total cholesterol levels in the three treatment groups using the CHOD-PAP method with a p-value of 0,000. Furthermore, further tests were carried out using the Post Hoct test statistical test, the results were:

1. There is a difference in treatment between 1 and 2 using the CHOD-PAP method by looking at the total cholesterol level, the p-value was 0.000
2. There is a difference in treatment between 1 and 3 using the CHOD-PAP method by looking at the total cholesterol level, the p-value was 0.000
3. There is no difference in treatment between 2 and 3 using the CHOD-PAP method by looking at the total cholesterol level, the p-value was 0.546

DISCUSSION

This study aims to determine the effectiveness of milk kefir with the addition of sorghum flour blood glucose in obese induced mice. Where at the time the study was conducted, the three treatment groups experienced weight gain. This increase in body weight was due to all mice being fed a high-fat diet. Of the three groups of mice

Table 1. Statistical Test of Blood Glucose Level Examination Results Using the COD-PAP Method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14123.117	2	7061.559	3.991	.031
Within Groups	44238.747	25	1769.550		
Total	58361.864	27			

Table 2. Statistical Test of Total Cholesterol Examination Results Using the CHOD-PAP Method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3452.154	2	1726.077	17.999	.000
Within Groups	2397.487	25	95.899		
Total	5849.641	27			

that were all treated, the group that fed only kefir had a greater appetite than the group that was given additional sorghum flour. This is because sorghum flour contains resistant starch and contains oligosaccharides that cannot be broken down by the body. Appetite in mice is influenced by several factors, one of which is an increase in blood glucose levels caused by the hormone leptin produced by the body. The hormone leptin produced will affect adipose tissue which will be related to the workings of the hypothalamus in the brain. In this study, it was found that there were differences in the treatment of the three groups on the value of blood glucose levels. This is because kefir has a bioactive function that functions as an antioxidant that will reduce free radicals formed in the body, while for the treatment group given additional sorghum flour also has a low glycemic index value.

Obesity is seen as multifactorial chronic disease causes that develop from interactions social, behavioral, psychological, metabolic, cellular, and molecular factors. This is the condition in which adipose tissue is located increases and can be defined as an increase weight due to excess fat accumulation.[6] This study is in line with research conducted by earlier study which shows that giving milk kefir can reduce the occurrence of hyperglycemia, insulin resistance and hyperglycemia, and can improve the balance of the intracellular metabolic system.[7] This is also reinforced by the opinion of Khuswatun's study in 2020 which states that regular consumption of kefir can prevent obesity, hypertension and diabetes. Kefir has properties as an anti-obesity food because it has properties that function to accelerate the body's metabolic system during the fat burning process, resulting in weight loss.[5]

The increase in total cholesterol levels occurred because the three treatment groups were given a high-fat diet. Based on the results, there were differences between the three treatment groups on total cholesterol levels. This is due to the nature of kefir and the addition of sorghum flour which will inhibit cholesterol levels in the body of white mice. Milk kefir has a very important role in reducing cholesterol levels, one of which is the phosphorus content in milk kefir. Sorghum flour also has a very important role to reduce obesity in the body, one of which is fiber, the function of this fiber is to control fat levels in the body which will affect cholesterol levels in the blood.[4]

This study is in line with previous study which states that sorghum contains antioxidant compounds (anthocyanins and tannins) which are rich in minerals Ca, P, Mg and Fe and contains dietary fiber which functions as a bile acid binder which functions to lower cholesterol levels. in blood.[8] The research above is also in line with the research of St-Onge's study in 2000 and Riyanto's study in 2011, cholesterol assimilation occurs by binding cholesterol to bacterial cell membranes attached to the intestinal mucosal wall so that the cellular membranes of lactic acid bacteria are more durable against lysis and decrease levels of free cholesterol which will be absorbed.[9]

CONCLUSION

This study showed that there are differences in blood glucose levels in the three treatment groups when tested using the COD-PAP method with a p-value of 0.031. It also showed that there are differences in total cholesterol levels in the three treatment groups when tested using the CHOD-PAP method with a p-value of 0.000. It is hoped that further research can be carried out by paying attention to the provision of milk kefir with the addition of sorghum flour, which can be given according to standard feed standards, and weight gain can be measured before and after being fed.

DISCLOSURE

Author Contribution

All authors have contributed to this research process, including conception and design, analysis and interpretation of the data, drafting of the article, critical revision of the article for important intellectual content, final approval of the article, collection and assembly of data.

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Conflict of Interest

There is no conflict of interest for this manuscript.

Ethical Consideration

This research was approved by the Research Ethics Committee of Teacher Training and Education, Elementary School Teacher Education Faculty, Nahdlatul Ulama Surabaya University, Surabaya, Indonesia. Letter of exemption Ref. No.200/EC/KEPK/UNUSA/2022

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REFERENCES

1. Cao SY. Dietary Plants, Gut Microbiota, and Obesity : Effect and Mechanisms. Trends Food Sci Technol. 2019;92:192–204.
2. Organization WH. Obesity. who.int. 2016.
3. M A. Hubungan Pola Makan Dan Tingkat Pengetahuan Dengan Kadar Asam Urat Dalam Darah Pada Penderita Gout Artritis Di Puskesmas Ranotana Weru. e-journal Keperawatan (e-Kp). 2019;7(1):1–8.
4. E S. Pengaruh Konsentrasi Tepung Sorgum (Sorghum bicolor L. Moench) Terhadap Beberapa Karakteristik Minuman Sinbiotik. Asian J Environ Hist Herit. 2017;1(2):1–11.
5. Khuswatun KS, Susanti S, Legowo AM. Karakteristik Es Krim Kefir Puree Buah Naga Merah Sebagai Pangan Fungsional Antiobesitas. J Food Technol Nutr. 2020;19(2):53–62.
6. Saturti TIA. Inflammation in obesity: a review. Bali Med J. 2022;11(3):1935–8.
7. Nogay NH. Kefir Beverage And Its Effect On Health: Milk-Based Beverage. Woodhead Publishing; 2019. 273–296 p.
8. Suarni, Subagio H. Prospek pengembangan jagung dan sorgum sebagai sumber pangan fungsional. J Penelit dan Pengemb Pertan. 2013;32(3):47–55.
9. MP S-O, ER F, PJH J. Consumption Of Fermented And Nonfermented Dairy Products: Effects On Cholesterol Concentrations And Metabolism. Am J Clin Nutr. 2000;71:674–81.