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Short Communication

Comparison of the Effect of Mango Mix Kefir or Watermelon Milk Kefir on Lipid Profile and Body Weight of Obese Women in Semarang, Indonesia

Wiwik Wijianingsih*, Sunarto Sunarto, Desi Wulandari

Poltekkes Kemenkes Semarang, Semarang, Central Java, Indonesia

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**Corresponding author:*
Wiwik Wijianingsih, MSc;
Poltekkes Kemenkes Semarang, 50192, Semarang, Central Java, Indonesia.
Tel: +6281229088864
Email: wijaningsihbambang@gmail.com

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ABSTRACT

Background: In addition to fruits and vegetables, functional foods such as kefir have also shown great potential in helping to address obesity issues. This study evaluated the effects of consuming mango mix kefir and watermelon milk kefir on lipid profiles, including cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), and triglycerides among obese women.

Methods: Sixty obese women were divided into two groups receiving either mango mix kefir or watermelon milk kefir for a period of 4 weeks.

Results: Mango mix kefir contributed to a reduction in cholesterol level by 5 mg/dL (MD: 5, 95% CI: -13.5-3.5, p=0.248) and LDL by 6.6 mg/dL (MD: 6.6, 95% CI: -13.7-0.4, p=0.066). However, no significant changes were observed in HDL and triglycerides for the mango mix kefir group. On the other hand, watermelon milk kefir resulted in a negligible reduction in cholesterol (0.3 mg/dL), HDL (2.5 mg/dL), LDL (4.8 mg/dL), and triglycerides (2.6 mg/dL), while none of which were statistically significant (p values ranging from 0.184 to 0.945).

Conclusion: The findings suggest that mango mix kefir has a more promising potential in improving lipid profile compared to watermelon milk kefir, though the effects were not significant to draw a definitive conclusion. Further research with longer intervention durations and more controlled variables is recommended to better understand the impact of these kefir variants on lipid metabolism and obesity management.

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Introduction

Obesity is a global health issue that has raised over the past few decades, with a prevalence that has continuously increased across various age groups, including children and adolescents. This condition not only affects physical appearance but also raises the risk of developing various degenerative diseases, such as type 2 diabetes, hypertension, coronary heart disease, and several types of cancer (1-3). Obesity can be defined as the excessive accumulation of fat in the body due to an imbalance between the energy intake and energy expenditure, which ultimately leads to an increase in body weight beyond the normal limit.

Obesity occurs when there is an accumulation of excess fat that causes a person's weight to be higher than it should be (4). One way to assess obesity status is by measuring Body Mass Index (BMI), where a BMI greater than 27 kg/m² indicates obesity (5).

Obesity in children, for example, has a broader impact, not only on physical aspects but also affecting their mental and social health. Obese children have a higher risk of respiratory disorders, decreased physical fitness, and face social discrimination such as bullying, which can affect their self-esteem. In the long term, this can impact their quality of life, even affecting academic performance and social relationships. Therefore, preventing and controlling obesity from an early age is crucial to reduce the risk of serious diseases in the future (4-6). The method commonly used to measure obesity status is through anthropometry, which includes measuring weight, height, and skinfold thickness. From the data obtained, BMI can be calculated, which serves as the primary indicator for determining an individual's obesity level (4-6).

Using BMI as a measurement tool is considered practical and efficient in assessing nutritional status and monitoring changes in obesity status over time (6). Although BMI provides a general overview, it should be noted that other factors, such as the distribution of body fat and physical activity levels, also play an essential role in determining an individual's health status (7). Obesity prevention is a crucial step, especially in the context of early intervention. One approach for managing obesity is by reducing calorie intake, choosing foods that are filling but low in calories, and increasing physical activity (7). This prevention program should be implemented from an early age so that children can grow with a healthier weight that is in line with their physical development. Moreover, maintaining a healthy and balanced diet is also essential, and one way to achieve this is by increasing the consumption of fruits and vegetables. Fruits and vegetables, which are rich in fiber, vitamins, and minerals, play a key role in regulating hunger without causing excessive fat accumulation in the body (8, 9).

The fiber found In fruits and vegetables, especially soluble fiber like pectin, has the ability to retain water, form a thick fluid in the digestive tract, and slow down the digestion process. This leads to a prolonged feeling of fullness, which can prevent overeating that contributes to obesity. Additionally, consuming fruits and vegetables, which are low in calories and contain healthy fats, can help regulate blood sugar levels and boost metabolism (10, 11). Some studies revealed that consuming fruits and vegetables can help reduce the risk of obesity, while not all individuals who regularly consume them are spared from this condition. Therefore, in addition to consuming fruits and vegetables, it is important to maintain an overall balanced diet (12).

In addition to fruits and vegetables, functional foods such as kefir have also shown great potential in helping to address obesity issues. Kefir is a fermented milk product that is known as a source of probiotics that contain beneficial bacteria that are very useful for improving gut microbiota and boosting the immune system. Kefir contains lactic acid bacteria (LAB), yeasts, vitamins, minerals, and essential amino acids that can enhance overall body health (13). It was shown that kefir consumption can help lower cholesterol level, reduce the risk of coronary heart disease, and prevent urinary tract infections. Kefir can also be a good choice in obesity prevention as it contains components that can improve bodily functions and increase metabolism (14).

Based on the above background, this study aimed to develop an innovative product in the form of kefir drinks combined with various types of fruit, which is not only delicious to consume; but also serves as a solution to lower total cholesterol, low density lipoprotein (LDL) and triglycerides, increase high density lipoprotein (HDL) level, and reduce body weight in obese women. This study will involve nutritional analysis of the fruit kefir formula, testing fiber content, and assessing the acceptability of this product. It is hoped that this fruit kefir product can be a beneficial alternative in obesity prevention and control, as well as contribute to the development of more practical and effective health solutions to improve people's quality of life.

Materials and Methods

This study aimed to assess the effects of consuming mixed fruit kefir and cow's milk fruit kefir on lipid profile (cholesterol, LDL, HDL, triglycerides) and body weight in obese women in Semarang, Indonesia. A two-phase approach was undertaken in this study including an R&D phase followed by an experimental phase with a pre-test and post-test control group design. Participants consumed either 200 mL of cow's milk fruit kefir, 200 mL of fruit kefir, 200 g of fruit, or no intervention for 28 days. Lipid profile and body weight were measured before and after the interventions. A total of 92 participants were finally enrolled, with inclusion criteria of a BMI over 25 kg/m². Data were collected using height and weight measurements, food intake records, and kefir consumption adherence tracking. Statistical analysis used SPSS software (Version 20, Chicago, IL, USA) involving ANOVA at a 99% confidence level, with post-hoc testing if significant differences were found. This study aimed to explore the potential of kefir in managing lipid profile and obesity in women as described before (15).

Results

The characteristics of obese women Prolanis members at Puskesmas Tlogosari Wetan and Puskesmas Tlogosari Kulon were summarized in Table 1. The average age of participants was 50 years, with a range from 18 to 76 years. Older age, especially in postmenopausal women, increases the risk of obesity. Most participants had an average weight of 66.2 kg and height of 150.8 cm, indicating mild to moderate obesity. Obesity in this group was largely attributed to an unbalanced diet and sedentary lifestyle. Food intake data showed insufficient energy, protein, carbohydrate, and fiber intake, with excessive fat intake. Despite normal total cholesterol level, low HDL and high LDL and triglyceride levels were noticed.

The distribution of cholesterol, HDL, LDL, and triglycerides in treatment group was demonstrated in Table 2. The Shapiro-Wilk normality test revealed that most variables, except for cholesterol, did not follow a normal distribution. The homogeneity of the characteristics of obese women Prolanis members was assessed using One-Way ANOVA, revealing that height was the only non-homogeneous variable, with a p-value of 0.019 (Table 3). This indicates a significant height difference between the treatment groups. Randomization in sample assignment minimizes bias in other variables like age, weight, and lipid profiles. To control for non-homogeneous variables like height, multivariate analysis was employed, enhancing the validity of the findings and offering clearer insights into the intervention's impact on lipid profiles. The effect of mango mix kefir and watermelon milk kefir on cholesterol, HDL, LDL, and triglycerides level was analyzed using an Independent t-test, as shown in Table 4.

The results revealed that mango mix kefir reduced cholesterol by 2 mg/dL (0.1%), while watermelon milk kefir led to a 5 mg/dL (2.6%) reduction. However, these reductions were not statistically significant. When controlling for initial cholesterol levels via multivariate analysis, mango mix kefir showed a cholesterol reduction of 6.9 mg/dL (MD: 6.9, 95% CI: -15.6–1.9, p=0.121), though it was still not significant. watermelon milk kefir resulted in a 2.4 mg/dL reduction (MD: 2.4, 95% CI: -11.2–6.4, p=0.593), which also lacked statistical significance. The Independent t-test illustrated that mango mix kefir reduced HDL by 10.3 mg/dL (5.3%), while watermelon milk kefir reduced HDL by 4.3 mg/dL (1%). After adjusting for pre-HDL, mango mix kefir reduced HDL by 9.4 mg/dL (6.5%), which was statistically significant (p=0.011). Watermelon milk kefir reduced HDL by 4.2 mg/dL, but this was not statistically significant (p=0.246).

The statistical test using the Independent t-test revealed that the consumption of mango mix kefir reduced LDL level by 14.7 mg/dL, which was equal to a 4.8% effect. In contrast, the consumption of watermelon milk kefir resulted in a

Table 1: Characteristics of overweight female Prolanis Members at Puskesmas Tlogosari Wetan and Puskesmas Tlogosari Kulon.

Variable	n	Min	Max	Mean	SD
Age (years)	101	18	76	50	16.28
Body weight before treatment (kg)	101	48	108	66.2	11.90
Height before treatment (cm)	101	137	168	150.8	6.46
HDL before treatment (mg/dL)	101	27	86	47.2	12.86
LDL before treatment (mg/dL)	101	45	224	104.7	29.29
Blood cholesterol before treatment (mg/dL)	101	71	273	170.3	40.40
Blood triglycerides before treatment (mg/dL)	101	31	585	153.8	79.17
Energy intake (Cal/day)	101	804	2603	1477.3	310.38
Protein intake (g/day)	101	23	102	52.8	16.97
Fat intake (g/day)	101	19	111	57.0	20.05
Carbohydrate intake (g/day)	101	80	421	194.2	60.21
Fiber intake (g/day)	101	2	35	9.5	5.88
Cholesterol intake (mg/day)	101	9	720	187.5	157.23
Energy sufficiency (%)	101	47	163	87.1	20.40
Protein adequacy (%)	101	44	243	96.3	32.34
Fat adequacy (%)	101	47	252	113.7	35.43
Carbohydrate adequacy (%)	101	31	152	74.4	25.12
Fiber adequacy (%)	101	9	213	41.7	32.37
Cholesterol adequacy (%)	101	3	240	62.5	52.41

Min: Minimum, Max: Maximum, LDL: Low density lipoprotein, HDL: High density lipoprotein.

reduction of LDL by 6.9 mg/dL, with a 1.1% effect. After controlling for the pre-LDL variable, the analysis showed that the consumption of mango mix kefir led to a reduction of LDL by 6.0 mg/dL, with a 3.0% effect. This result is nearly statistically significant with a *p* value of 0.088 (MD: 6.0, 95% CI: -12.9-0.9), indicating the potential probiotic effect of mango mix kefir in lowering LDL.

Table 2: Distribution of cholesterol, HDL, LDL, and triglycerides data of overweight female Prolanis Members at Puskesmas Tlogosari Wetan and Puskesmas Tlogosari Kulon.

Variable	Treatment group	Shapiro-Wilk		
		Statistic	df	*P* value
Cholesterol before treatment	Mango kefir mix intervention	0.97	33	0.62
	Watermelon milk kefir intervention	0.99	34	0.98
	Control	0.98	34	0.79
HDL before treatment	Mango kefir mix intervention	0.87	33	0.00
	Watermelon milk kefir intervention	0.96	34	0.17
	Control	0.95	34	0.14
LDL before treatment	Mango kefir mix intervention	0.92	33	0.02
	Watermelon milk kefir intervention	0.92	34	0.02
	Control	0.90	34	0.00
Triglycerides before treatment	Mango kefir mix intervention	0.68	33	<0.00
	Watermelon milk kefir intervention	0.91	34	0.00
	Control	0.93	34	0.02
Cholesterol after treatment	Mango kefir mix intervention	0.98	33	0.75
	Watermelon milk kefir intervention	0.98	34	0.89
	Control	0.95	34	0.10
HDL after treatment	Mango kefir mix intervention	0.92	33	0.02
	Watermelon milk kefir intervention	0.96	34	0.22
	Control	0.78	34	<0.00
LDL after treatment	Mango kefir mix intervention	0.90	33	0.00
	Watermelon milk kefir intervention	0.91	34	0.00
	Control	0.85	34	<0.00
Triglycerides after treatment	Mango kefir mix intervention	0.71	33	<0.00
	Watermelon milk kefir intervention	0.84	34	<0.00
	Control	0.90	34	0.00

Df: Degree of freedom, LDL: Low density lipoprotein, HDL: High density lipoprotein.

Table 3: Homogeneity of characteristics of obese women Prolanis Members at Puskesmas Tlogosari Wetan and Puskesmas Tlogosari Kulon.

Variable	Group									
	Mango kefir mix intervention			Watermelon kefir milk intervention			Control			*P* value*
	n	Mean	SD	n	Mean	SD	n	Mean	SD	
Age (years)	33	46.1	17.23	34	53.4	14.65	34	51.6	16.47	0.162
Body weight before treatment (kg)	33	69.5	13.70	34	65.9	12.16	34	63.3	8.93	0.101
Height before treatment (cm)	33	153.3	6.75	34	149.1	5.58	34	150.1	6.42	0.019
Blood cholesterol before treatment (mg/dL)	33	166.4	35.98	34	182.2	43.78	34	162.2	39.31	0.098
HDL before treatment (mg/dL)	33	46.5	13.88	34	47.4	12.83	34	47.6	12.20	0.925
LDL before treatment (mg/dL)	33	98.9	26.13	34	105.3	31.05	34	109.8	30.21	0.310
Blood triglycerides before treatment (mg/dL)	33	163.2	89.58	34	154.6	81.09	34	143.8	66.68	0.608
Energy sufficiency (%)	33	83.8	18.49	34	85.6	20.76	34	91.9	21.50	0.235
Protein adequacy (%)	33	99.4	28.85	34	90.1	31.17	34	99.4	36.51	0.401
Fat adequacy (%)	33	121.8	36.27	34	112.7	29.58	34	106.8	39.20	0.219
Carbohydrate adequacy (%)	33	72.7	22.78	34	69.0	25.13	34	81.6	26.29	0.103
Fiber adequacy (%)	33	39.3	28.91	34	38.1	21.71	34	47.5	42.89	0.434
Cholesterol adequacy (%)	33	68.1	50.63	34	54.7	52.04	34	64.9	55.03	0.553

*One Way Anova. LDL: Low density lipoprotein, HDL: High density lipoprotein, SD: Standard deviation.

Table 4: The effect of mango mix kefir and watermelon milk kefir on cholesterol, HDL, LDL, and triglycerides.

Variable	Group	MD	*P* value	Effectiveness
Cholesterol	Mango mix kefir	-3.1	0.757	0.1%
	Watermelon milk kefir	+15.8	0.110	2.6%
Cholesterol (adjusted)	Mango mix kefir	-6.9	0.121	2.5%
	Watermelon milk kefir	-2.4	0.593	0.3%
HDL	Mango mix kefir	-10.3	0.022	5.3%
	Watermelon milk kefir	-4.3	0.327	1.0%
HDL (adjusted)	Mango mix kefir	-9.4	0.011	6.5%
	Watermelon milk kefir	-4.2	0.246	1.4%
LDL	Mango mix kefir	-14.7	0.029	4.8%
	Watermelon milk kefir	-6.9	0.295	1.1%
LDL (adjusted)	Mango mix kefir	-6.0	0.088	3.0%
	Watermelon milk kefir	-3.3	0.335	1.0%
Triglycerides	Mango mix kefir	-6.9	0.121	2.5%
	Watermelon milk kefir	-2.4	0.593	0.3%
Triglycerides (adjusted)	Mango mix kefir	-13.1	0.287	1.2%
	Watermelon milk kefir	+2.0	0.868	0%
Summary	Mango mix kefir	Chol: -5; HDL: -8.1; LDL: -6.6; TG: -11	HDL is significant (*p*=0.029), LDL is approaching significance	Chol: 1%, HDL: 5%, LDL: 4%, TG: 1%
	Watermelon milk kefir	Chol : -0.3; HDL: -2.5; LDL: -4.8; TG: +2.6	All is no significant	All ≤2%

LDL: Low density lipoprotein, HDL: High density lipoprotein, MD: Mean difference.

On the other hand, the consumption of watermelon milk kefir reduced LDL by 3.3 mg/dL, but this reduction was not statistically significant (MD: 3.3, 95% CI: -10.1-3.5, p=0.335), with a 1.0% effect. The reduction in LDL observed in both intervention groups showed a positive effect on the lipid profile of the body. The larger effect was seen in the mango mix kefir group, although this reduction has not yet reached a fully significant level. However, the reduction in LDL in the mango mix kefir group demonstrated greater potential compared to watermelon milk kefir. However, watermelon milk kefir still illustrated some potential in influencing LDL metabolism, even though the reduction is not statistically significant.

The results of the independent t-test show that the consumption of mango mix kefir can reduce triglyceride levels by 6.9 mg/dL, which corresponded to a 2.5% effect. On the other hand, the consumption of watermelon milk kefir only reduced triglyceride level by 0.3 mg/dL, which results in a 2.6% effect. However, this reduction in triglyceride level may be overestimated due to differences in pre-treatment triglyceride data between the treatment groups.

After controlling for pre-treatment triglyceride level, the analysis showed that the consumption of mango mix kefir can reduce triglyceride level by 13.1 mg/dL, although this reduction was not statistically significant (MD: 13.1, 95% CI: -37.4 to 11.2, p=0.287). The consumption of mango mix kefir resulted in a 1.2% reduction in triglyceride level. On the other hand, the consumption of watermelon milk kefir actually led to a slight increase in triglyceride level by 2.0 mg/dL, although this increase was also not statistically significant (MD: 2.0, 95% CI: -22.0 to 26.0, p=0.868). Therefore, it can be concluded that watermelon milk kefir did not have a significant effect on triglyceride level. The analysis exhibited significant differences between the effects of the two types of kefir on the body's lipid profile, although not all results reached statistical significance.

Results from mango mix kefir consumption in relation to cholesterol indicated that consumption of mango mix kefir reduced cholesterol by 5 mg/dL, but this reduction was not statistically significant (MD: 5, 95% CI: -13.5-3.5, p=0.248). This reduction in cholesterol contributed to about a 1% decrease in cholesterol level. Regarding HDL, mango mix kefir consumption led to a significant decrease in HDL by 8.1 mg/dL (MD: 8.1, 95% CI: -15.3-8.0, p=0.029). This reduction was equivalent to a 5% decrease in HDL, indicating a potential probiotic effect in lowering the good cholesterol in the body. Considering LDL, the decline in LDL level resulted from mango mix kefir consumption was recorded at 6.6 mg/dL (MD: 6.6, 95% CI: -13.7-0.4, p=0.066), though this reduction was close to being statistically significant. This effect was equivalent to a 4% decrease in LDL level. For triglycerides, mango mix kefir consumption decreased triglyceride level by 11.0 mg/dL, but this reduction was not statistically significant (MD: 11.0, 95% CI: -36.3-14.3, p=0.390), resulting in an approximately 1% reduction.

Results from watermelon milk kefir consumption, for cholesterol level; consumption of watermelon milk kefir only decreased cholesterol level by 0.3 mg/dL (MD: 0.3, 95% CI: -8.9-8.3, *p*=0.945), which was not statistically significant. Watermelon milk kefir did not reveal any significant effect on cholesterol reduction. Regarding HDL, the decrease in HDL resulted from watermelon milk kefir consumption was 2.5 mg/dL, but this reduction was not statistically significant (MD: 2.5, 95% CI: -9.8-4.8, *p*=0.504), suggesting that watermelon milk kefir did not significantly affect HDL levels. Considering LDL, watermelon milk kefir consumption reduced LDL by 4.8 mg/dL (MD: 4.8, 95% CI: -12.0-2.3, *p*=0.184), though this decline was not statistically significant, with an approximately 2% effect on LDL level. In relation to riglyceride level, watermelon milk kefir reduced triglycerides by 2.6 mg/dL, though this decrease was not statistically significant (MD: 2.6, 95% CI: -23.0-28.1, *p*=0.842), showing no significant effect on triglyceride levels.

Discussion

In our study, similar to another research, the average age of participants was 50 years, with a range from 18 to 76 years. Older age, especially in postmenopausal women, increases the risk of obesity due to hormonal changes affecting fat distribution and lipid metabolism (15). We showed food intake data was insufficient for energy, protein, carbohydrate, and fiber intake, with excessive fat intake. This imbalance contributed to dyslipidemia and cardiovascular risk, as excessive saturated fat raises LDL levels and lowers HDL (15). Despite normal total cholesterol level, low HDL and high LDL levels and triglyceride level indicated an increased risk of heart diseases (16).

In Shapiro-Wilk normality test, we demonstrated that most variables, except for cholesterol, did not follow a normal distribution. Identically, statistical tests like the independent t-test or One-Way ANOVA remained valid with large sample sizes, even with non-normally distributed data (15). The wide variation in triglyceride level (average 153.8 mg/dL, range 31-585 mg/dL) of our study indicated a significant difference in risk among participants, emphasizing the need to control variables for accurate outcome analysis (15).

The homogeneity of the characteristics of obese women of Prolanis members in our assessment was based on One-Way ANOVA, revealing that height was the only non-homogeneous variable. This indicated a significant height difference between the treatment groups. Randomization in sample assignment minimized bias in other variables like age, weight, and lipid profiles. Ensuring homogeneity in experimental studies is vital for fair comparisons of intervention effects (17).

We illustrated mango mix kefir appeared more effective in reducing cholesterol, potentially due to the presence of mangiferin, a phytochemical in mango that has hypolipidemic properties. Watermelon, being water-rich, may have a more limited impact on cholesterol metabolism (17). Probiotics in kefir, such as Lactobacillus and Bifidobacterium, play a role in lipid metabolism by inhibiting cholesterol synthesis in the liver and increase the cholesterol excretion (18). Additionally, the fiber content in mango helps bind cholesterol in the intestines, contributing to a lower cholesterol level (11).

Overall, consumption of mango mix kefir showed a more significant effect in lowering cholesterol, LDL, and triglycerides compared to watermelon milk kefir. Although not all results were statistically significant, the potential probiotic effects in managing lipid profile, particularly with a longer intervention period, showed promising results. The differences In results between the two types of kefir may be due to the different base ingredients. Mango mix kefir contains more phytochemicals from mango, which potentially have a stronger metabolic effect on lipid profile. On the other hand, watermelon milk kefir is more focused on hydration, which may explain the more moderate effects on lipid metabolism. The reduction in cholesterol and triglyceride levels by probiotics in kefir can be explained by several biochemical mechanisms, such as enhanced fatty acid metabolism, reduced cholesterol synthesis in the liver, and decreased fat absorption in the digestive tract. Mango, which is rich in fiber and phytochemicals, may provide an additional effect in regulating lipid metabolism, whereas watermelon, despite being rich in water, may not have the same metabolic effect (11).

Conclusion

It was shown that both fruit mix kefir and fruit milk kefir had potential health benefits, though their effects on lipid metabolism and weight management were different. Fruit mix kefir demonstrated a greater potential in improving lipid profile, with more significant reduction in LDL and triglyceride levels, although not all results reached statistical significance. On the other hand, fruit milk kefir, while also offering some benefits, particularly in hydration, had more moderate effects on lipid metabolism and did not illustrate significant changes in cholesterol, HDL, or triglyceride levels compared to fruit mix kefir. Regarding weight management, fruit mix kefir had potential in helping control body weight, though its effects were limited and required further researches with longer durations and stricter control. Overall, fruit mix kefir demonstrated more promising results in improving lipid profile and aiding weight management in obese women, while fruit milk kefir focused more on hydration and overall body wellness.

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Authors' Contribution

Wiwik Wijianingsih was responsible for the research concept, proposal preparation, study implementation, data analysis, and manuscript drafting. Sunarto contributed to study supervision, interpretation of the results, and critical revision of the manuscript. Desi Wulandari contributed to data collection, data processing, and manuscript refinement. All authors read and approved the final manuscript. The authors declare that there is no conflict of interest in this stu

Conflict of Interest

None declared.

References

1 Hosseini SE, Rezaei E, Mehrabani D, et al. Effect of pomegranate juice on lipid profile in streptozotocin-induced diabetic adult male rats. *J Exp Anim Biol*. 2013;2:13-20.

2 Hosseini SE, Mehrabani D, Ghaedi HR. The effect of pomegranate juice on hemogram and weight profile in streptozotocin-induced diabetic adult male rats. *Damghan J Zool.* 2013;6:1-8.

3 Aghasadeghi K, Zarei-Nezhad M, Keshavarzi A, et al. The Prevalence of Coronary Risk Factors In Iranian Lor Migrating Tribe. *Arch Iran Med.* 2008;11:322-325. PMID: 18426325.

4 Wijaksana IKE. Infectobesity dan Periodontitis: Hubungan Dua Arah Obesitas dan Penyakit Periodontal. *Odonto Dental Journal.* 2016;3:67-73.

5 Santoso A. Serat Pangan (Dietary Fiber) Dan Manfaatnya Bagi Kesehatan. *Magistra*. 2011;23:35-40.

6 Wijaningsih W, Rahmawati AY, Hunandar C. Efektifitas Pemberian Kefir Kacang Hijau Terhadap Profil Lipid (Kolesterol Total, LDL, HDL, Trigliserid) Organ Dewasa. *Naskah Publikasi, Jurusan Gizi Politeknik Kesehatan Kemenkes Semarang.* 2017. (Preprint).

7 Dehghanpisheh S, Daryanoosh F, Mehrabani D, et al. The effect of eight weeks aerobic exercise on visfatin level in non-athletic young women, southern Iran. *Middle-East J Sci Res*. 2014;21:314-319. DOI: 10.5829/idosi.mejsr.2014.21.02.8255.

8 Jaelani M, et al. Consumption of 5 Servings of Fruit and Vegetable and Lipid Profile Improvement on Overweight Adolescents: a Randomized Control Trial. *Adv Health Sci Res.* 2019;13:196–204. DOI: 10.2991/ichs-18.2019.24.

9 Rasekh H, Mehrabani D, Farahi MH, et al. Screening of Feijoa (Acca Sellowiana (O. Berg) Burret) Fruit Effect on Proliferation and Apoptosis using Bone Marrow derived Stem Cells Model. *Electron J Gen Med*. 2020;17:em1-6.

10 Ko SH, Jung Y. Energy metabolism changes and dysregulated lipid metabolism in postmenopausal women. *Nutrients*. 2021;13:1-12. DOI: 10.3390/nu13124556.

11 Mehrabani D, Mehrvarz S, Rabiee M. The Effect of Aqueous and Hydroalcoholic Extracts of the mango fruit on development of embryonic tissues during pregnancy. *Int J Nutr Sci*. 2019;4:202-205. DOI:10.30476/ijns.2019.83956.1040.

12 Dewi FU, Sugiyanto S. Hubungan Asupan Zat Gizi, Aktifitas Fisik, Lingkar Perut dan Persen Lemak Tubuh dengan Kadar Kolesterol Total Penderita Dislipidemia Rawat Jalan di RSUD dr. Doris Sylvanus Palangka Raya. *J Forum Kesehatan : Media Publikasi Kesehatan Ilmiah*. 2020;10. DOI:10.52263/jfk.v10i2.204.

13 Sivamaruthi BS, et al. The influence of probiotics on bile acids in diseases and aging. *Biomed Pharmacotherapy.* 2020;128:110310. DOI:10.1016/j.biopha.2020.110310.

14 Ko SH, Jung, Y. Energy metabolism changes and dysregulated lipid metabolism in postmenopausal women. *Nutrients*. 2021;13:1-12. DOI: 10.3390/nu13124556. PMID: 34960109.

15 Ayyun K, et al. Artikel Riview : Profil Studi Fitokimia Dan Aktivitas Farmakologi Buah Mangga (Mangifera Indica L .) *JFKES: J Sains Farmasi Dan Kesehatan*. 2023;01:60-68.

16 Zaki I, et al. Perbandingan Efektivitas Buah Mangga , Jeruk , dan Naga terhadap Penurunan Kadar Low-Density Lipoprotein (Studi pada Tikus Sprague Dawley Hiperkolesterolemia) Comparison of the Effectiveness of Mango , Orange , and Dragon Fruit Juice on Low-Density Lipo. *Media Gizi Kesmas*. 2024;13:698-706.

17 Kabir Y, Shekhar HU, Sidhu JS. Phytochemical Compounds in Functional Properties of Mangoes', *Handbook of Mango Fruit: Production, Postharvest Science, Processing Technology and Nutrition*. 2017;237-254. DOI:10.1002/9781119014362.ch12.

18 Masoumi SJ, Mehrabani D, Saberifiroozi M, et al. The effect of yogurt fortified with Lactobacillus acidophilus and Bifidobacterium sp. probiotic in patients with lactose intolerance. *Food Sci Nutr*. 2021;9:1704-1711. DOI: 10.1002/fsn3.2145. PMID: 33747481.