HEALTH, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT: INTERDISCIPLINARY APPROACH, 2025 No. 1, p. 93-99
eISSN 3030-2323; DOI: https://doi.org/10.59476/hesdia.v0i1.701 / https://ojs.kaunokolegija.lt/index.php/HESDIA

ASSOCIATIONS BETWEEN INTERMITTENT FASTING AND ANTHROPOMETRIC DATA IN HEALTHY SUBJECTS

Sandra Vaskelė, Rasa Volskienė

[1]*Kauno kolegija Higher Education Institution*

Abstract. Recently, increasing attention has been directed towards novel treatment methods aimed at addressing the pathophysiological consequences of obesity and metabolic syndrome. One such approach is intermittent fasting (IF), a dietary method characterized by alternating periods of eating and fasting within a given day. This study employed two intermittent fasting patterns: 16/8 and 12/12. The 16/8 pattern involved fasting for 16 hours and consuming all meals within the remaining 8 hours, while the 12/12 pattern entailed 12 hours of fasting and 12 hours of eating, with both approaches adhering to healthy dietary recommendations. The study included 10 participants (9 women and 1 man) with a mean age of 20.10 ± 1.45 years and a mean body mass index (BMI) of 29.76 ± 5.04 kg/m². Anthropometric measurements, including BMI, weight, muscle mass, fat mass, and visceral fat mass, were collected at three time points: baseline, mid-point, and endpoint. These measurements were performed using a body composition analyzer Tanita DC-360 S. After five months, the results indicated an overall average decrease in BMI of 0.54 kg/m². In the 16/8 IF group, BMI decreased by an average of 0.82 kg/m², while in the 12/12 IF group, the reduction averaged 0.3 kg/m². Regarding weight loss, participants in the 16/8 IF group experienced an average decrease of 2.5 kg, whereas those in the 12/12 IF group lost an average of 1 kg. Changes in body fat mass were observed in all participants. The 16/8 IF group demonstrated an average reduction in body fat mass of 1.7 kg, while the 12/12 IF group showed an average reduction of approximately 1 kg. At the beginning of the study, the mean fat mass of participants was 30.41 ± 9.42 kg, which decreased to 29.15 ± 9.44 kg by the study's endpoint. Muscle mass changes varied between the groups: participants in the 16/8 IF group experienced an average decrease of 0.8 kg, whereas those in the 12/12 IF group showed a slight increase of 0.02 kg.
Keywords: intermittent fasting, body composition

Introduction

According to Vasim et al. (2022), there is a growing focus on innovative treatments to combat the pathophysiological consequences of obesity and metabolic syndrome. Although substantial progress has been made in the development of new medical treatments for obesity, there has also been an increasing emphasis on improving dietary patterns through various nutritional regimens. Intermittent fasting (IF) is one such tool. Intermittent fasting refers to a dietary approach that alternates between periods of eating and fasting, typically lasting no more than 24 hours (Attinà et al., 2021). Although intermittent fasting has gained significant public interest primarily as a weight-loss method (Patikorn et al., 2021), it offers benefits beyond weight management, including improvements in brain function, cardiovascular health, oxidative stress reduction, inflammation mitigation, stress resilience, metabolism enhancement, and blood glucose regulation (Kim et al., 2021; Attinà et al., 2021). During fasting, processes such as lipolysis, ketogenesis, and autophagy occur in the body (Attinà et al., 2021). The energy deficit induced by intermittent fasting contributes to reductions in visceral and trunk fat (Naous et al., 2023). Healthy nutrition involves consuming macronutrients – carbohydrates, proteins, and fats in proportions that meet energy and physiological requirements. Simultaneously, micronutrients and fluids must be adequate to fulfill the body's physiological needs. Macronutrients support cellular processes essential for daily functioning, while micronutrients, including vitamins and minerals, play a crucial role in growth, development, metabolism, and overall physiological processes (Cena and Calder, 2020).

The aim of this research was to investigate the associations between different intermittent fasting patterns and anthropometric data in healthy subjects. The research focused on changes in anthropometric data among healthy individuals following healthy eating recommendations and engaging in various intermittent fasting patterns.

Subjects and sample collection

The research was conducted between August 2023 and April 2024. Eligibility criteria required participants to have a primary goal of reducing body weight and/or improving body composition, a body mass index (BMI) ≥ 24 kg/m², be aged 18–30 years, and be in good health (i.e., free from any acute or chronic diseases during the study). Additionally, participants were required not to use any drugs or supplements during the research period. Participants were recruited for the study through voluntary registration via email, followed by attendance at an introductory meeting.

The study involved 10 healthy individuals who aimed to lose weight or improve body composition. Participants could choose between intermittent fasting (IF) patterns and were required to follow healthy eating guidelines for 5 months. The mean age of the participants was 20.10 ± 1.45 years, the mean BMI was 29.76 ± 5.04 kg/m², and the mean weight was 85.5 ± 20.47 kg. The 16/8 IF pattern was chosen by 4 participants, and the 12/12 IF pattern by 6 participants. The 16/8 IF pattern involved fasting for 16 hours per day and consuming all calories during the remaining 8 hours, while the 12/12 pattern involved fasting for 12 hours per day and consuming all calories during the remaining 12 hours. A structured calendar was developed to monitor adherence to the intermittent fasting protocol. Participants documented daily compliance with the specified fasting and eating schedules. The study did not require participants to maintain detailed food intake records.

Material and Methods

The participants were provided with a printed leaflet containing health-promoting dietary recommendations, which they followed throughout the study. Nutritional recommendations were based on the Ministry of Health of the Republic of Lithuania's guidelines (2022), emphasizing a balance of macronutrients (proteins, carbohydrates, and fats) and micronutrients (vitamins and minerals). Recommendations included lean protein sources (legumes, fish, eggs, low-fat dairy), whole grains, fresh fruits and vegetables, and healthy fats (unrefined oils). Foods high in saturated fats, trans fats, refined grains, added sugars, and processed foods were limited.

Specific recommendations included:

- breakfast: whole grain porridge, eggs, sandwiches, or pancakes.
- snacks: fruits, Greek yogurt, nuts, or healthy crisps.
- lunch: meat or fish with whole grain side dishes and soups.
- dinner: salads, stews, or cottage cheese, eggs dishes.

During fasting hours, participants could consume water, black coffee, or tea. Chia seeds (15 g) were allowed if hunger was uncontrollable. The need for fluid intake was emphasized.

The nutritional recommendations were designed to be easily understood by all participants. Those following the 16/8 intermittent fasting pattern were advised to skip snacks and delay their breakfast to a slightly later time of the day. Participants in the 12/12 intermittent fasting group, however, were instructed to eat four meals daily. Temporal effects of meal frequency on health have been of interest to researchers for years (Paoli et al., 2019). According to Sawicka-Śmiarowska et al. (2021), daily energy requirements depend on factors such as gender, age, height, weight, health status, and physical activity. Blazey et al. (2023) reported that both interventional and observational studies found that more frequent meals (up to five daily) may correlate with better health outcomes. However, consuming more than six meals per day has been associated with a significantly increased risk of various diseases (Paoli et al., 2019).

Anthropometric data were collected using a professional body composition analyzer Tanita DC-360 S. The method of bioelectrical resistance analysis is commonly used to assess body composition. This method involves passing low-voltage electrical pulses of different frequencies through the body to measure resistance, reactance, and intracellular properties. Based on these measurements, the analyzer calculates body composition metrics such as subcutaneous fat, visceral fat, lean (muscle) mass, water content, metabolic age, and basal metabolism, using population reference equations. The monitored indicators included body mass index (BMI), weight (kg), muscle mass (kg), fat mass (kg), and visceral fat mass. Measurements were taken at three time points during the study: baseline, mid-point (6–7 weeks after the first measurement), and endpoint (7–8 weeks after the second measurement).

A quantitative research method and experimental diagnostic design were chosen to evaluate the effects of different intermittent fasting patterns on anthropometric data in healthy individuals following healthy nutrition recommendations. Data analysis was performed using SPSS Statistics 29 and Microsoft Excel. Non-parametric Wilcoxon signed-rank and Mann-Whitney U tests were employed for statistical analysis. These tests were chosen because they do not assume normality in the distribution of the data, making them suitable for small sample sizes and ordinal or non-normally distributed continuous data. Given the limited sample size (n = 10) and the nature of the measured variables, these tests provided a robust approach to evaluating changes within and between groups. The small sample size (n = 10) represents a limitation of the study. However, statistical analyses were conducted using methods appropriate for small samples, ensuring the reliability of the findings.

Results

BMI was one of the selection criteria for participation in the study. As per the inclusion criteria, all participants had a baseline BMI ≥ 24 kg/m². The mean BMI of the participants was 29.76 ± 5.04 kg/m², with the highest BMI at baseline being 40.6 kg/m² and the lowest 24.5 kg/m². The overall average BMI reduction across the sample was 0.54 kg/m². In the 16/8 intermittent fasting group, the average BMI reduction was 0.82 kg/m², while in the 12/12 IF group, it was 0.3 kg/m². The greatest BMI reduction observed was 1.7 kg/m². The average BMI at baseline and endpoint for each intermittent fasting pattern is presented in Figure 1.

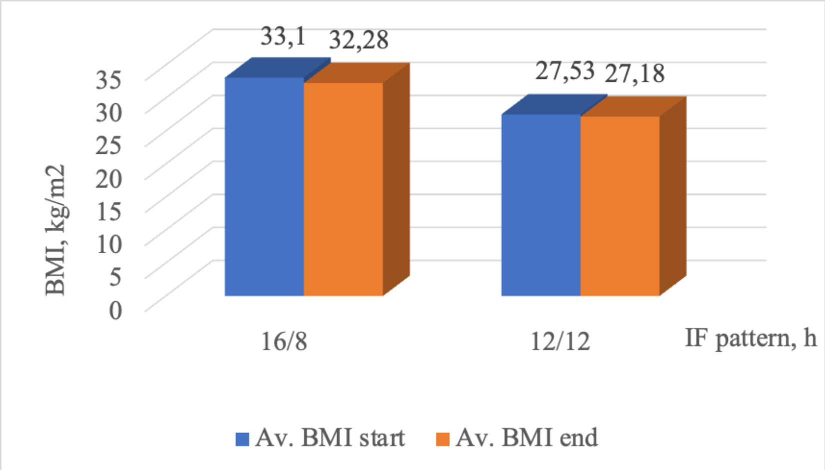

Fig. 1. BMI (average) at the start and at the end of research

Weight changes were observed in all participants. The mean initial weight of the subjects was 85.51 ± 20.47 kg, while the mean final weight was 83.93 ± 20.28 kg. The average weight reduction across the total sample was 1.6 kg. In the 16/8 IF group, the average weight decrease was 2.5 kg, with the greatest reduction reaching 5.3 kg. In the 12/12 IF group, the average weight loss was 1 kg, with the largest decrease recorded at 2.9 kg. The average weight values at the beginning and end of the study for both intermittent fasting patterns are displayed in Figure 2.

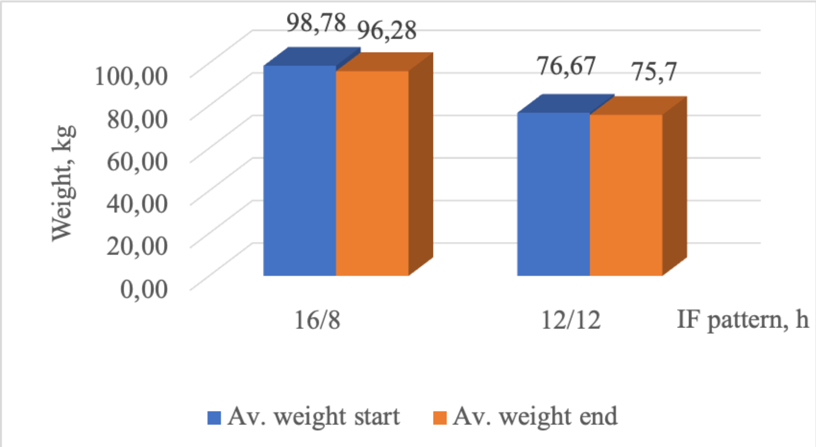

Fig. 2. Weight (average) at the start and at the end of research

Body fat mass changes were observed in all participants also. The average body fat mass reduction in all participants was 1.26 kg. In the 16/8 IF group, the average body fat mass decrease was 1.7 kg, with the largest reduction reaching 3.5 kg. In the 12/12 IF group, the average decrease was nearly 1 kg, with the largest reduction observed at 2.7 kg. The mean body fat mass at the beginning of the study was 30.41 ± 9.42 kg, while at the end it was 29.15 ± 9.44 kg. The average body fat mass values at the start and end of the study for both intermittent fasting patterns are illustrated in Figure 3.

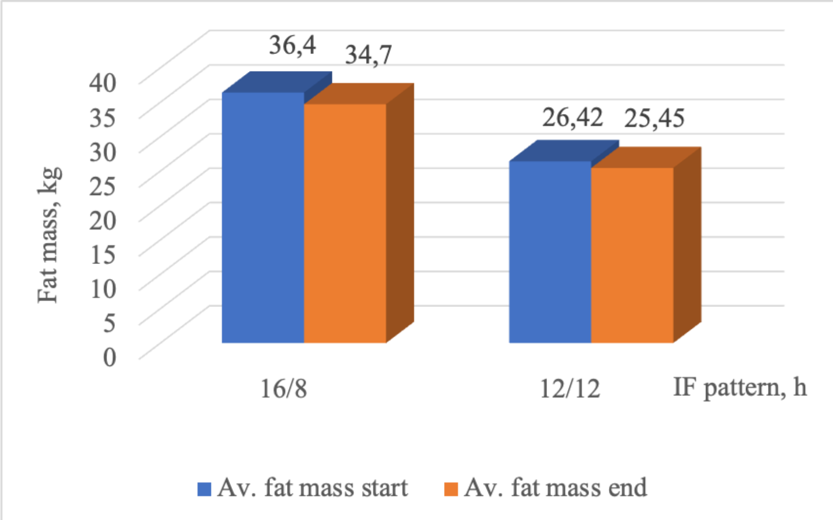

Fig. 3. Body fat mass (average) at the start and at the end of research

The mean visceral fat across all participants was 5.40 ± 3.89 at the start of the study and 4.90 ± 3.72 at the end. All participants in the 16/8 IF group and one participant in the 12/12 IF group reduced visceral fat by one level. The average visceral fat values at the beginning and end of the study for each intermittent fasting pattern are shown in Figure 4.

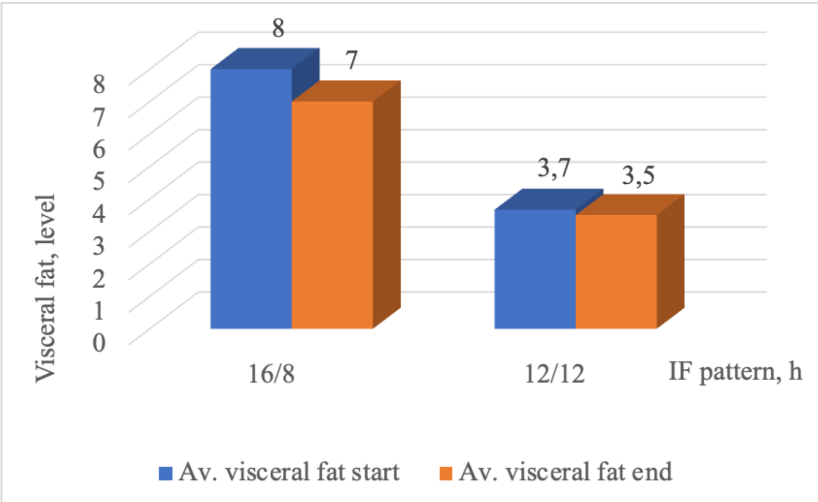

Fig. 4. Visceral fat mass (average) at the start and at the end of research

The mean muscle mass of the participants was 52.32 ± 11.7 kg at the start of the study and 52.02 ± 11.5 kg at the end. In all aprticipants muscle mass decreased on average by 0.3 kg. The average muscle mass decrease for participants in the 16/8 IF group was 0.8 kg. A slight increase in muscle mass was observed in three participants in the 12/12 IF group, with the largest increase being 1.3 kg (in the 12/12 IF group). The average muscle mass values at the beginning and end of the study for both intermittent fasting patterns are shown in Figure 5.

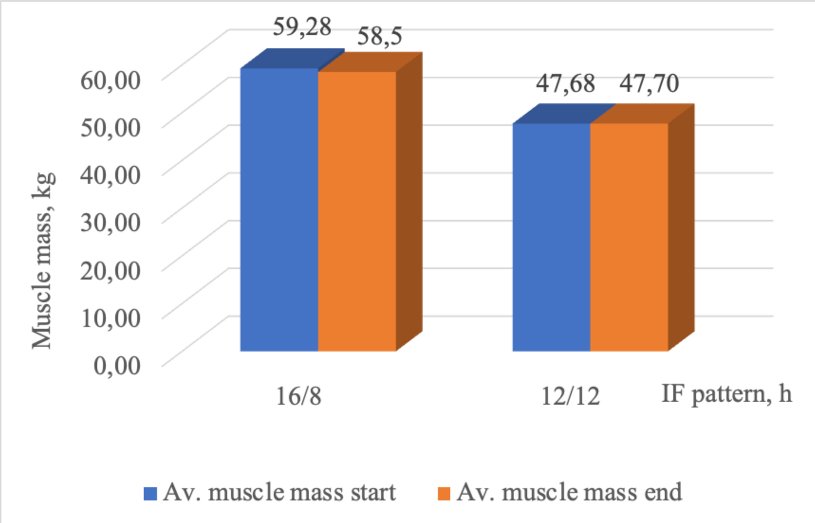

Fig. 5. Muscle mass (average) at the start and at the end of research

A non-parametric Wilcoxon signed-rank test was used to compare the anthropometric data at the start and the end of the study for each IF pattern. It was identified that the difference in weight was not statistically significant in the 16/8 IF group (Z = -1.461, p = 0.144) and in the 12/12 IF group (Z = -1.572, p = 0.116). Similarly, BMI changes were not statistically significant in both IF patterns: 16/8 pattern (Z = -1.461, p = 0.144) and 12/12 pattern (Z = -1.472, p = 0.141). The difference in fat mass was not statistically significant in the 16/8 pattern (Z = -1.826, p = 0.068), but a statistically significant difference was found in the 12/12 IF pattern (Z = -2.023, p = 0.043). A statistically significant difference in visceral fat was found in the 16/8 IF group (Z = -2.000, p = 0.046); however, in the 12/12 IF group, the difference was not statistically significant (Z = -1.625, p = 0.104). The difference in muscle mass was not statistically significant in both groups: 16/8 IF group (Z = -1.461, p = 0.144) and 12/12 IF group (Z = -0.105, p = 0.916). A comparison of anthropometric data at the start and end of the study in IF pattern groups is presented in Table 1.

Table 1. Comparison of anthropometric data at the start and at the end of research in 16/8 (n=4) and 12/12 (n=6) IF pattern

	Start of research		End of research		Z	p
	Md	Min–Max.	Md	Min–Max.		
Weight 16/8	97,90	67,6–131,7	95,40	65,3–129,0	-1,461	0,144
Weight 12/12	72,95	65–91,40	72,85	62,9–91,4	-1,572	0,116
BMI 16/8	32,70	26,4–40,6	31,90	25,5–39,8	-1,461	0,144
BMI 12/12	27,65	24,5–30,5	27,6	23,7–30,7	-1,472	0,141
Fat mass 16/8	40,05	21,4–44,1	38,15	20,2–42,3	-1,826	0,068
Fat mass 12/12	24,9	18,0–36,5	24,2	17,2–36,5	-2,023	0,043
Visceral fat mass 16/8	7,00	3–15	6,00	2–14	-2,000	0,046
Visceral fat mass 12/12	3,50	2–6	3,50	1–6	-1,625	0,104
Muscle mass 16/8	54,95	43,9–83,3	54,35	42,8–82,5	-1,461	0,144
Muscle mass 12/12	46,65	44,4–52,1	46,50	43,4–52,5	-0,105	0,916

Whereas no significant differences were found in all anthropometric data in different IF pattern groups, it was decided to combine both groups and check whether intermittent fasting, regardless of the pattern (in the total group of subjects), helps to reduce weight, BMI, fat, muscle mass and visceral fat. Non-parametric Wilcoxon signed-rank test was used to compare the anthropometric data of all subjects at the start and at the end of research regardless IF pattern. It was identified that statistically significantly decreased weight (Z=-2,193, p=0,028), BMI (Z=-2,145, p=0,032), fat mass (Z=-2,666, p=0,008) and visceral fat mass (Z=-2,236, p=0,025). No statistically significant difference in muscle mass was found (Z=-0,969 p=0,333). Comparison of anthropometric data (median, minimum and maximum, Z and p values) of all subjects (n=10) at the start and at the end of research, regardless of the IF pattern, is presented in Table 2.

Table 2. Comparison of anthropometric data at the start and at the end of research regardless IF pattern (n=10)

	Start of research		End of research		Z	p
	Md	Min–Max.	Md	Min–Max.		
Weight	81,15	65,0–131,7	80,40	62,9–129,0	-2,193	0,028
BMI	29,4	24,5–40,6	28,45	23,7–39,8	-2,145	0,032
Fat mass	29,25	18–44,1	28,6	17,2–42,3	-2,666	0,008
Visceral fat mass	4,5	2–15	4,5	1–14	-2,236	0,025
Muscle mass	49,25	43,9–83,3	49,15	42,8–82,5	-0,969	0,333

The Mann-Whitney U test was used to compare the changes between IF patterns. A comparison of the changes in the anthropometric data between different IF patterns is shown in Table 3.

Table 3. Comparison of anthropometric data in 16/8 and 12/12 IF patterns

	16/8 IF pattern		12/12 IF pattern		U	p
	Md	Av. ranks	Md	Av. ranks		
Change of weight	-2,5	4,13	-0,75	6,42	6,5	0,257
Change of BMI	-0,85	4,25	-0,30	6,33	7,0	0,352
Change of fat mass	-1,5	4,25	-0,85	6,33	7,0	0,352
Change of visceral fat mass	-1,0	3,0	0,0	7,17	2	0,038
Change of muscle mass	-0,95	4,25	-0,1	6,33	7,0	0,352

The difference between the IF patterns was not statistically significant when comparing changes in weight (U=6.5, p=0.257), BMI (U=7, p=0.352), fat mass (U=7, p=0.352), and muscle mass (U=7, p=0.352). It was identified that the decrease in visceral fat mass was statistically significant in the 16/8 group (U=2, p=0.038). This suggests that the 16/8 regimen was more effective in reducing visceral fat compared to the 12/12 IF pattern.

Conclusions

1. Comparing the results separately within each group, it was found that fat mass statistically significantly decreased in the 12/12 group, and visceral fat mass in the 16/8 group. The remaining anthropometric data (weight, BMI, and muscle mass) did not change statistically significantly in both groups.
2. Comparing the results in the whole sample regardless of IF pattern, it was found out that there was statistically significant decrease in weight, BMI, fat mass and visceral fat mass, while muscle mass did not change statistically significantly.
3. It was found that the 16/8 intermittent fasting pattern was statistically significantly effective in reducing visceral fat mass compared to the 12/12 pattern. Changes in the remaining anthropometric data (weight, BMI, fat mass and muscle mass) did not differ between the different intermittent fasting patterns.

Practical significance

This study offers insights into the potential benefits of intermittent fasting (IF) patterns for improving body composition and supporting health in young adults. The findings indicate that the 16/8 IF pattern may aid in reducing visceral fat mass, while the 12/12 IF pattern appears to support body fat mass reduction. These observations suggest that incorporating IF into health-promoting strategies could be beneficial for weight management and metabolic health. Additionally, the research highlights the importance of pairing IF with balanced nutritional practices to optimize its effects. Nevertheless, the small sample size limits the ability to draw broad conclusions. Further studies involving larger and more diverse populations are needed to confirm these findings and better understand the effectiveness of different IF patterns.

References

1. Attinà, A., Leggeri, C., Paroni, R., Pivari, F., Dei Cas, M., Mingione, A., Dri, M., Marchetti, M., & Di Renzo, L. (2021). *Fasting: How to Guide. Nutrients, 13(5),* 1570.
2. Blazey, P., Habibi, A., Hassen, N., Friedman, D., Khan, K. M., & Ardern, C. L. (2023). The effects of eating frequency on changes in body composition and cardiometabolic health in adults: a systematic review with meta-analysis of randomized trials. *The international journal of behavioral nutrition and physical activity*, *20*(1), 133.

3. Cena, H., & Calder, P. C. (2020). Defining a Healthy Diet: Evidence for The Role of Contemporary Dietary Patterns in Health and Disease. *Nutrients*, *12*(2), 334.
4. Kim, B. H., Joo, Y., Kim, M. S., Choe, H. K., Tong, Q., & Kwon, O. (2021). Effects of Intermittent Fasting on the Circulating Levels and Circadian Rhythms of Hormones. *Endocrinology and metabolism (Seoul, Korea)*, *36*(4), 745–756.
5. Naous, E., Achkar, A., & Mitri, J. (2023). Intermittent Fasting and Its Effects on Weight, Glycemia, Lipids, and Blood Pressure: A Narrative Review. *Nutrients*, *15*(16), 3661.
6. Ministry of health of the republic of Lithuania. (2023). *Detailed recommendations for a healthy diet (2022).*
7. Patikorn, C., Roubal, K., Veettil, S. K., Chandran, V., Pham, T., Lee, Y. Y., Giovannucci, E. L., Varady, K. A., & Chaiyakunapruk, N. (2021). Intermittent Fasting and Obesity-Related Health Outcomes: An Umbrella Review of Meta-analyses of Randomized Clinical Trials. *JAMA network open*, *4*(12), e2139558.
8. Paoli, A., Tinsley, G., Bianco, A., & Moro, T. (2019). The Influence of Meal Frequency and Timing on Health in Humans: The Role of Fasting. *Nutrients*, *11*(4), 719.
9. Sawicka-Śmiarowska, E., Moniuszko-Malinowska, A., & Kamiński, K. A. (2021). Which Microbes Like My Diet and What Does It Mean for My Heart? *Nutrients*, *13*(11), 4146.
10. Vasim, I., Majeed, C. N., & DeBoer, M. D. (2022). Intermittent Fasting and Metabolic Health. *Nutrients*, *14*(3), 631.

Information about the authors

Sandra Vaskelė, Kauno kolegija Higher Education Institution, lecturer. Research field(s): public health. Email address: sandra.vaskele@kaunokolegija.lt
Rasa Volskienė, Kauno kolegija Higher Education Institution, PhD, lecturer. Research field(s): public health. Email address: rasa.volskiene@kaunokolegija.lt