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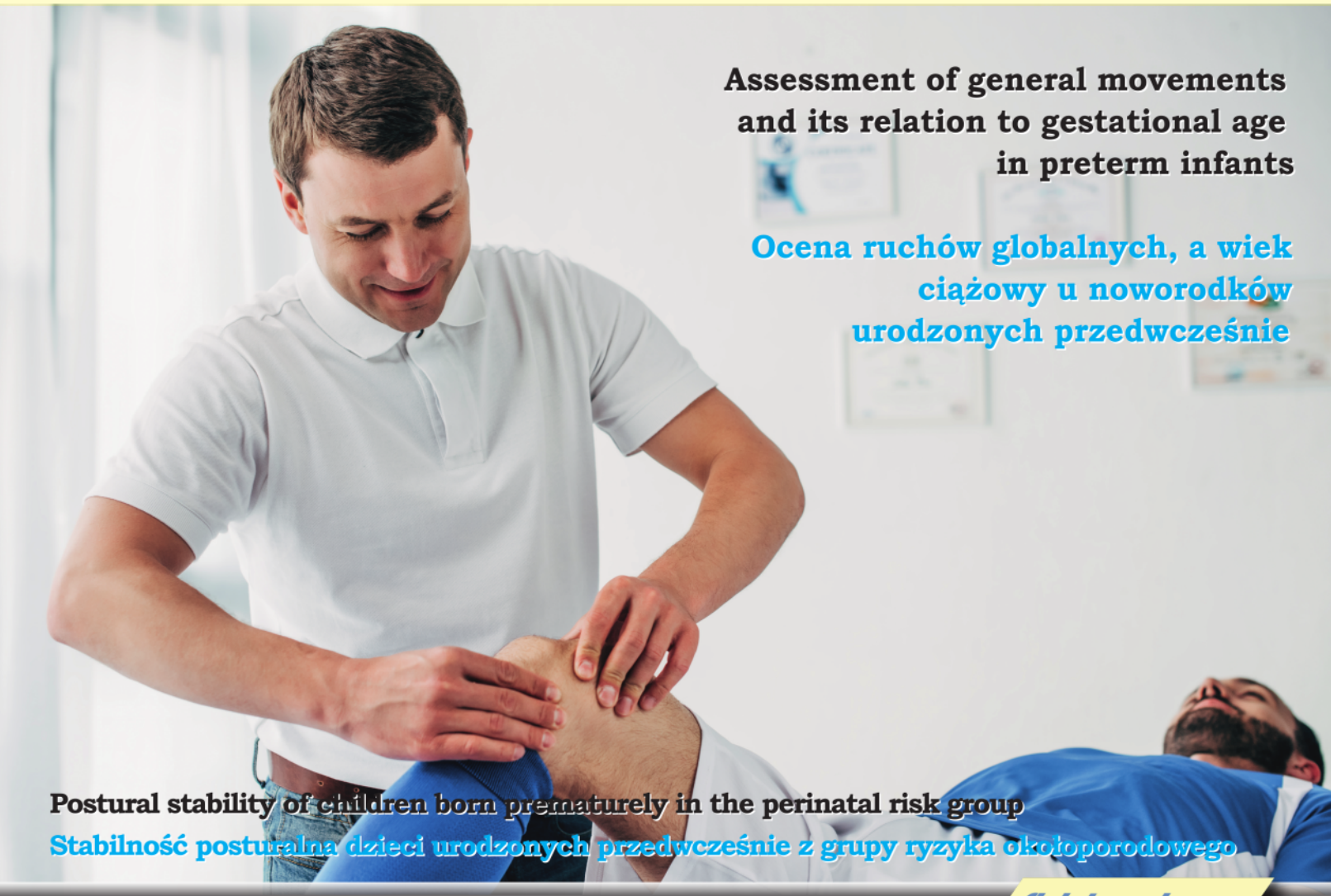

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Effect of whole body vibration versus high intensity interval training on interleukin-6 in obese post-menopausal women

Wpływ wibracji całego ciała w porównaniu z treningiem interwałowym o wysokiej intensywności na interleukinę-6 u otyłych kobiet po menopauzie

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Abstract

Background. Menopause and aging affect the health of obese women, provoking accumulation of visceral adipose tissue (VAT) and inflammation. Obesity leads to major health problems, which increase the risk of debilitating diseases that lead to death. Thus, loss of weight and VAT are primary goals of treatment through modifications of dietary habits and exercise. Purpose of the study. This study was conducted to determine which is more effective on interleukin- 6 (IL-6) levels for obese post-menopausal women, whole body vibration training (WBVT) or high intensity interval training (HIIT). Subjects and methods. 45 post-menopausal obese women diagnosed with higher level of IL-6, their body mass index (BMI) > 30 kg/m2 and waist/hip ratio (W/H ratio) > 0.8 participated at this study. Women were divided randomly into 3 equal groups in numbers; Group (A) followed low caloric diet (1200 Cal), Group (B) received WBVT and Group (C) received HIIT. Both groups (B & C) followed the same low caloric diet as group (A). Evaluation was done before and after 3 months of treatment, through measuring weight, BMI, waist as well as hip circumferences, W/H ratio and IL-6 levels. Results. The three groups revealed statistically significant improvements ($P < 0.05$) in all parameters after treatment compared to baseline. Also, there were statistically differences between the 3 groups after treatment, with the group (B) more favorable than groups (A & C). Conclusion. WBVT is more effective than HIIT on reducing inflammation via reducing IL-6 level in obese post-menopausal women.

Key words:

obesity, menopause, whole body vibration exercise, high intensity interval training, interleukin-6

Streszczenie

Informacje wprowadzające. Menopauza i starzenie się wpływają na zdrowie otyłych kobiet, prowokując kumulację trzewnej tkanki tłuszczowej i stany zapalne. Otyłość prowadzi do poważnych problemów zdrowotnych, które zwiększają ryzyko wyniszczających chorób prowadzących do śmierci. Zatem utrata wagi i trzewnej tkanki tłuszczowej są głównymi celami leczenia poprzez modyfikację nawyków żywieniowych i ćwiczeń. Cel badania. Badanie przeprowadzono w celu określenia, która metoda jest bardziej skuteczna w zakresie wpływu na poziom interleukiny-6 (IL-6) u otyłych kobiet po menopauzie: trening wibracyjny całego ciała (WBVT) lub trening interwałowy o wysokiej intensywności (HIIT). Materiał i metody. W badaniu wzięło udział 45 otyłych kobiet po menopauzie, u których stwierdzono wyższy poziom IL-6, wskaźnik masy ciała (BMI) > 30 kg/m2 oraz wskaźnik talia/biodra (W/H) > 0,8. Kobiety zostały losowo podzielone na 3 równe grupy; Grupa (A) stosowała dietę niskokaloryczną (1200 kcal), grupa (B) była poddawana WBVT, a grupa (C) była poddawana HIIT. Grupy (B i C) stosowały tę samą niskokaloryczną dietę co grupa (A). Oceny dokonano przed i po 3 miesiącach leczenia poprzez pomiar masy ciała, BMI, obwodu talii i bioder, wskaźnika W/H oraz poziomu IL-6. Wyniki. We wszystkich trzech grupach wykazano statystycznie istotną poprawę ($p < 0,05$) we wszystkich parametrach po leczeniu w porównaniu z wartościami wyjściowymi. Wystąpiły również statystycznie istotne różnice między 3 grupami po leczeniu, przy czym grupa (B) uzyskała bardziej korzystne wyniki niż grupy (A i C). Wniosek. WBVT jest skuteczniejszą metodą niż HIIT w zmniejszaniu stanu zapalnego poprzez zmniejszenie poziomu IL-6 u otyłych kobiet po menopauzie.

Słowa kluczowe

otyłość, menopauza, ćwiczenia wibracyjne całego ciała, trening interwałowy o wysokiej intensywności, interleukina-6

Introduction

Menopause refers to permanent stoppage of menstrual cycle, leading to termination of ovarian follicles development [1]. It develops at the age of 49–52 years [2], as a result of reduced estrogen production by the ovaries during the peri-menopause to reach very small quantities in post-menopausal women, its receptors are found in a lot of tissues, including vascular endothelial cells, smooth muscles, cardiac tissue, bladder, urethra, ovaries and bones, thus it may impact all of these tissues [3, 4]. Also, it may maintain the immune function, which may be affected at menopause in women [5].

Post-menopausal women are usually concerned with weight gaining and increasing waist circumference (WC) caused by obesity. In obese persons, occurrence of hyper-triglyceridemia in addition to insulin resistance leads to diminished fasting glucose, increased levels of blood sugar, accumulation of visceral adipose tissue (VAT) and inflammation [6].

Cascades of inflammation are triggered by proximal mediators like interleukin-6 (IL-6), a cytokine released in different tissues that has pro-inflammatory consequences involving production of positive acute phase proteins via hepatic stimulation following infection or tissue injury [7]. It is produced from muscle, which is elevated during muscle contraction [8] by a lot of cell of various types, such as cells involved in immunity as well as adipose tissue that makes responses to inflammation [9]. Its receptor is notified at many brain sites, like the hypothalamus, where energy intake and appetite are controlled, also, it maintains energy homeostasis through inhibiting activity of lipoprotein lipase [10].

Behavioral treatments, such as weight loss and exercise decrease inflammatory markers [11]. Loss of weight in combination with high physical activity produce reduction in levels of IL-6 and C-reactive protein (CRP) in pre-menopausal women suffering from obesity [12].Engaging in hypo-caloric higher-protein/lower-carbohydrate diets improve body composition in obese women after menopause [13]. Some studies revealed an improvement in body composition in response to exercise practicing [14] and lower-carbohydrate, higher protein diets [15].

Whole Body Vibration Training (WBVT) has developed as an alternative method for strengthening exercises. It can be used as a resistance exercise since it improves skeletal muscles force and power and treat obesity. In fact, it improves composition of the body and muscular strength [16]. It can produce a slight but significant reduction in body weight and WC, because WC reduction can be a good indicator of better health in patients with central obesity [17].

High-intensity interval training (HIIT) represents an exercise type that involves an alternation between short repetitive bouts of vigorous exercising and intervals of passive or active recovery. It has been shown to produce improvements in several clinical outcomes [18]. It can induce higher alterations in weight of the body and its composition with very shorter time commitment (e.g., 10-15 minutes of HIIT, 5 days weekly versus 30 minutes of traditional exercises, 5 days weekly). Since it may produce health advantages in a shorter period of time, it may be beneficial for post-menopausal women suffering from obesity [19].

To our knowledge, no study has compared the impact of WBVT versus HIIT on interleukin-6 (IL-6) in obese women after menopause. Therefore, this study aimed to compare the effect of WBVT versus HIIT on IL-6in obese post-menopausal women.

Subject, materials and methods

Study Design

This study was designed as a randomized, single-blind, pre–post-test, controlled trial. Ethical approval was taken from the institutional review board at Faculty of Physical Therapy, Cairo University before beginning of the study [No: PT.REC/012/003216]. The study was conducted between August 2019 till October 2020.

Subjects

Forty-five obese post-menopausal women, diagnosed with high level of IL-6, participated in this study. They were recruited from the Gynecology Outpatient Clinic, Kasr Al Ainy Hospital, Cairo University, Egypt. Their age ranged from 45 to 55 years, BMI was > 30 kg/m^2, and waist/hip ratio (W/H ratio) was > 0.8. All women who had any medical disorders such as thyroid disease, diabetes, hypertension, lower limbs and back disorders, neoplasm and hemorrhagic diseases or those who were under anti-inflammatory drugs, hormonal replacement therapy or engaged in another method of training programs were excluded from this study.

Randomization

Each participant provided informed consent after being informed about the study's nature, purpose and advantages, as well as their ability to decline or withdraw anytime and the confidentiality of any data collected. All data coding ensured anonymity. A computer-based randomization program was used for randomizing the participants into three equal groups (A, B & C). After randomization, no dropping out of participants from the study, Figure 1.

Interventions

Group (A) included 15participants who followed restricted diet protocol (1200 Cal) for 12 weeks, group (B) included 15 participants who participated in WBVT program for 12 weeks, and group (C) included 15 participants who participated in HIIT program for 12 weeks. Both groups (B & C) followed the same diet as group (A) and performed the training program 3 times per week.

Low caloric diet

All participants in the three groups (A, B & C) were advised to follow the same hypo caloric diet of 1200 Cal/day for 12 weeks that included 15% carbohydrate, 55% protein, 30% fat [20].

Whole body vibration training (WBVT)

All participants in group (B) received vibration training in the form of whole body vibration, 3 sessions per week, for 12 weeks. They were informed and instructed about the benefits of exercise to gain their confidence and cooperation. They were

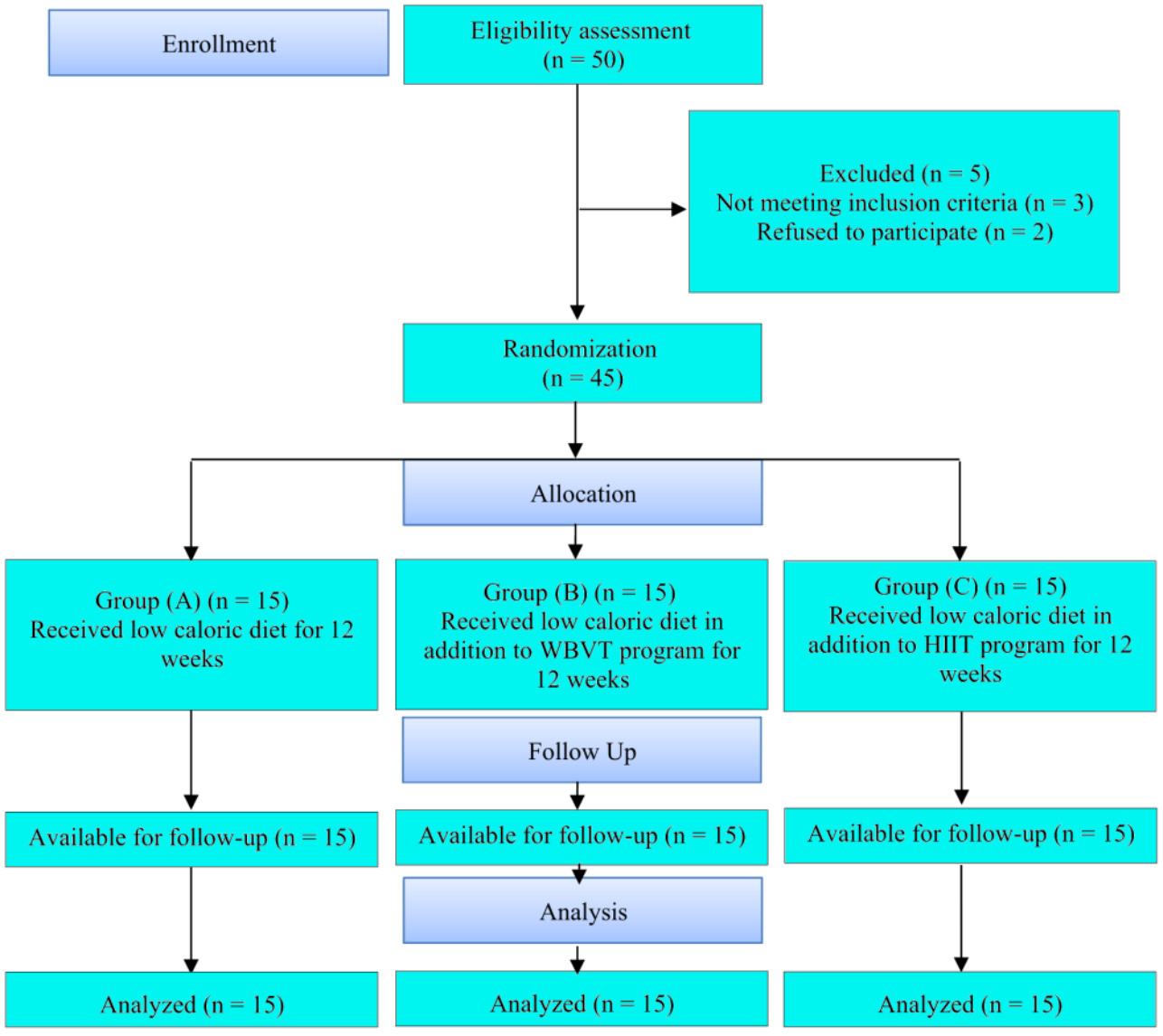

Figure 1. Flow chart of the study

advised to evacuate their bladders before starting the treatment session to be more relaxed. Each participant warmed up and cooled down for 5 minutes on a treadmill (model 04055191, Taiwan) with speed adjusted at 2 Km/h. The phase of vibration training was performed on a whole body vibration platform (model GB9201, China), which had the following characteristics: Rate Voltage: 220V, Rated Frequency: 60 Hz, and Power: 300W. The WBVT was done using a single vibration with 30 Hz prevailing and began with 2 sets for 10 minutes at the 1st 3 weeks, then 4 sets for 15 minutes at the 2nd 3 weeks, then 6 sets for 20 minutes at the 3rd 3 weeks and ended with 8 sets of 30 minutes at the last 3 weeks of training. The rest period was 5 minutes after each set of training, for a total of 40 minutes of exercise per session [21].

High intensity interval training (HIIT)

All participants in group (C) received HIIT program, 3 sessions per week, for 12 weeks. They received information and instructions about the values of exercise to obtain their confidence and cooperation. They were instructed to evacuate their bladders before beginning the treatment session for more relaxation. Each participant performed warming up and cooling down for 5 minutes on a treadmill (model 04055191, Taiwan) with speed adjusted at 2 km/h. The HIIT program was performed using the same treadmill machine, which had the following characteristics: speed range: 0-12 KM/H, elevation range: 0–15, and power: 2 horse power. The HIIT program consisted of 4 minutes intervals at 85% of target heart rate (HR) with a speed adjusted at 5 Km/h, then, 3 minutes active recovery period at 50% of target HR between intervals and a speed of 3 Km/h, for a total of 38 minutes of exercise per session, including warm-up and cool-down [22]. The target HR was calculated according to the following equation: Target HR = [(max HR − resting HR) × %Intensity] + resting HR. To calculate the maximum HR, the age was subtracted from 220 [23].

Outcome measures

Anthropometric measures

Anthropometric measures were measured for the three groups before and after 12 weeks of treatment. The body weight and height were measured for each participant using calibrated standard weight – height scale; each participant stood two times wearing light clothes and bare feet and the average of the weight and height were taken. Then, BMI was calculated according to the formula: BMI = Weight (Kg)/Height (m)2. The circumferences of the waist and hips were measured with a tape measure. At the end of gentle expiration, WC was measured at the midpoint between the margin of the lowest rib and the iliac crest, while the hip circumference (HC) was measured at the level of greater trochanter. Then, WC was divided by HC to calculate the W/H ratio [24].

Assessment of interleukin- 6 (IL-6) levels

A sample of (1.5 ml) blood was drawn from each participant in the three groups before and after 12 weeks of treatment, and was put in lavender (EDTA) top tube, then was centrifuged at 1500 for 10 minutes, plasma aliquot was removed and E411 machine was used for analysis to measure the IL-6.

Statistical analysis

The statistical package for social studies (SPSS) version 25 for Windows was used to conduct the analysis (IBM SPSS, Chicago, IL, USA).For the comparison of subject characteristics between groups, descriptive statistics and the ANOVA test were used. To ensure that all variables had a normal distribution, the Shapiro-Wilk test was used. For testing homogeneity between groups, Levene's test was used. To assess the effects of time (before versus post) and treatment (between groups), as well as the interaction between time and treatment on mean values of weight, BMI, WC,HC,W/H ratio and IL-6, mixed ANOVA (MANOVA) was used. Post-hoc tests using the Bonferroni correction were conducted for subsequent multiple comparison. For all statistical tests, the significance level was set at $p < 0.05$.

Results

Baseline characteristics

The baseline characteristics of the three groups (A, B& C) were similar with regards to age, weight, height and BMI ($p > 0.05$) (Table 1).

Table 1. Baseline characteristics of participants in both groups

Variables	Group A Mean ± SD	Group B Mean ± SD	Group C Mean ± SD	p-value
Age [years]	48.26 ± 2.68	47.6 ± 2	48.4 ± 2.32	0.61
Weight [kg]	90.8 ± 6.64	91 ± 7.6	90.26 ± 5.11	0.95
Height [cm]	158.73 ± 4.23	159.46 ± 5.51	159.26 ± 2.98	0.89
BMI [kg/m²]	36.01 ± 1.87	35.74 ± 1.68	35.6 ± 2.05	0.82

SD, standard deviation; p-value, level of significance

Effect of treatment on Weight, BMI, WC, HC, W/H ratio and IL-6

A significant interaction of treatment and time was discovered using mixed MANOVA ($F = 18.7$, $p = 0.001$). The main effect of time was significant ($F = 387.26$, $p < 0.001$). The main effect of treatment was significant ($F = 4.75$, $p = 0.001$).

Within group comparison

Within-group comparison revealed a significant improvement in the three groups. There was a significant lowering in weight, BMI, WC, HC and IL6 ($p < 0.001$) and significant increase in W/H ratio ($p < 0.05$) within the three groups after treatment compared to before treatment (Table 2).

Between group comparison

Between group comparisons demonstrated non-significant differences in all variables ($p > 0.05$) before treatment. Comparison between groups after treatment demonstrated significant decreases in weight, BMI, WC, HC and IL-6 and a significant increase in W/H ratio of group (B) compared to group (A) ($p < 0.001$) and group (C) ($p < 0.05$). It was a significant decrease in weight, BMI, WC, HC and IL-6 and a significant increase in W/H ratio of group (C) compared to group (A) after treatment ($p < 0.05$) (Table 2).

Table 2. Mean weight, BMI, WC, HC, W/H ratio and IL-6 pre and post treatment of the three groups

Variables		Group (A) mean ± SD	Group (B) mean ± SD	Group (C) mean ± SD	(A) vs (B)	p-value (A) vs (C)	(B) vs (C)
Weight [kg]	Pre treatment	90.8 ± 6.64	91 ± 7.6	90.26 ± 5.11	0.09	0.09	0.09
	Post treatment	86.73 ± 6.65	75.8 ± 4.93	81.33 ± 3.97	0.001	0.02	0.02
	MD (95% CI)	4.07 (2.36–5.76)	15.2 (13.49–16.9)	8.93 (7.23–10.63)			
		p = 0.001	**p = 0.001**	**p = 0.001**			

Variables		Group (A) mean ± SD	Group (B) mean ± SD	Group (C) mean ± SD	(A) vs (B)	p-value (A) vs (C)	(B) vs (C)
BMI [kg/m²]	Pre treatment	36.01 ± 1.87	35.74 ± 1.68	35.6 ± 2.05	0.09	0.09	0.09
	Post treatment	34.4 ± 1.98	29.81 ± 1.43	32.08 ± 1.76	0.001	0.002	0.003
	MD (95% CI)	1.61(1–2.21)	5.93 (5.32–6.53)	3.52 (2.91–4.12)			
		p = 0.001	**p = 0.001**	**p = 0.001**			
WC [cm]	Pre treatment	100.6 ± 5.64	100.06 ± 5.48	99.93 ± 3.77	0.09	0.09	0.09
	Post treatment	95.46 ± 5.61	85.26 ± 4.8	90.6 ± 4.03	0.001	0.02	0.01
	MD (95% CI)	5.14 (4–6.26)	14.8 (13.67–15.93)	9.33 (8.2–10.46)			
		p = 0.001	**p = 0.001**	**p = 0.001**			
HC [cm]	Pre treatment	113.6 ± 5.44	112.4 ± 3.73	111.13 ± 4.3	0.09	0.43	0.09
	Post treatment	104.86 ± 5.75	87.2 ± 4.6	96.2 ± 3.19	0.001	0.001	0.001
	MD (95% CI)	8.74 (6.17–11.3)	25.2 (22.64–22.75)	14.93 (12.37–17.5)			
		p = 0.001	**p = 0.001**	**p = 0.001**			
W/H ratio	Pre treatment	0.88 ± 0.05	0.89 ± 0.05	0.9 ± 0.05	0.09	0.09	0.09
	Post treatment	0.91 ± 0.04	0.97 ± 0.02	0.94 ± 0.03	0.001	0.03	0.01
	MD (95% CI)	−0.03 (−0.04– −0.002)	−0.08 (−0.11– −0.06)	−0.04 (−0.06– −0.01)			
		p = 0.03	**p = 0.001**	**p = 0.001**			
IL-6 [pg/ml]	Pre treatment	14.34 ± 2.9	15.4 ± 2.17	15.64 ± 2.75	0.09	0.09	0.09
	Post treatment	11.19 ± 1.83	7.03 ± 2.13	8.94 ± 1.62	0.001	0.006	0.02
	MD (95% CI)	3.15 (2.28–4.02)	8.37 (7.5–9.24)	6.7 (5.82–7.57)			
		p = 0.001	**p = 0.001**	**p = 0.001**			

SD, standard deviation; p-value, level of significance

Menopause is commonly an origin of several concerns within women. The fear of weight gain is the main one. Obesity and metabolic syndrome are three times more common in women throughout this stage of their lives than pre-menopause [25].The current study was conducted to determine the effect of WBVT versus HIIT on IL-6 in obese post-menopausal women.

Results revealed that in group (A) which received the diet regime, there was a significant decrease in the BMI, W/H ratio, and IL-6. These findings were in agreement with Tray hurn and Wood [26] who found a significantly reduced CRP levels in obese women who followed a program of weight loss utilizing a low caloric, low fat dietary regime (1,360 kcal/d, 15% fat) for 3 months, also they found that weight reduction by 4% was accompanied by CRP reduction by 45%. In addition, these researchers proposed that IL-6 secreted by adipose tissues may mediate the elevated CRP seen in obese people, as there is an extensive evidence about the definition of obesity as a chronic state of inflammation, as reflected by highly production of several adipokines related to inflammation, such as leptin, IL-6 and tumor necrosis factor alpha (TNFα). If such mechanism is implicated in regulating production of CRP, a decrease in levels of IL-6 should correspond to a decrease in levels of CRP in obese persons who lose weight. Clifton [27] who has reported that weight loss, whatever the type of diet, has an anti-inflammatory effect, as well as lowering effects on levels of IL-6 and CRP. Heilbronn et al., [28] who reported that loss of weight through a hypo-caloric dietary regime produces reductions inIL-6, TNF and CRP levels in women suffering from obesity.

In group (B), which received diet regime and WBVT, there is a significant decrease in the BMI, W/H ratio, andIL-6.These findings agreed with Vissers et al., [29] who reported that diet plus WBVT displayed a significant decrease in weight. Furthermore, visceral adipose tissue changed more in this group who followed diet plus WBVT compared to the control group (A& C) that could be explained by the effect WBVT which is a short cycles that frequently considered a form of strength training because vibrations stimulate muscle spindle afferents [30]. Additionally, Rehn et al., [31] revealed that WBVT had a higher possibility of improving muscular performance to the same if not larger than traditional training approaches in sedentary and old aged persons.

In group (C), which received diet regime and HIIT, there was a significant decrease in the BMI, W/H ratio, and IL-6 more than in group (A&B) in obese post-menopausal women after 12 weeks of the treatment. These results were in agreement with Weston et al. [32], who have found that exercise, particularly HIIT, has been proven to produce anti-inflammatory markers as well as improve blood lipid profile, metabolic characteristics, composition of the body and quality of life.

Concerning the comparison between groups post-treatment, the results of this study showed greater weight loss and improvement in the levels of IL-6 in obese post-menopausal women who received combined diet and WBVT in comparison to diet alone or combined diet and HIIT.

The impact of WBVT versus HIIT on IL-6 in obese post-menopausal women was not tested in the review of literature. Accordingly, the current study is thought to be the first of its type in this field. As a result, the findings of this study cannot be compared to those of other studies, although they demonstrated that WBVT had significantly superior effect on IL-6 levels than HIIT in obese post-menopausal women.

The current study has some limitations that include its small sample size and the lack of measuring other inflammatory markers like TNFα and CRP. Therefore, larger-sample studies investigating additional inflammatory markers are required in the future. Moreover, as the current study is limited to postmenopausal women, its findings cannot be extended to other populations.

Conclusion

It can be concluded that WBVT produces greater weight loss and improvement in the levels of IL-6 in obese post-menopausal women than diet alone or combined diet and HIIT.

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Piśmiennictwo/ References

1. Spinelli MG. Depression and hormone therapy. Clin Obstet Gynecol. 2004; 47(2):428-436.
2. Takahashi TA, Johnson KM. Menopause. Med Clin North Am. 2015; 99(3):521-534.
3. Gruber CJ, Tschugguel W, Schneeberger C, et al... Production and actions of estrogens. N Engl J Med. 2002; 346(5):340-352.
4. Aleshmawy DM, Okeil FM, Yousef AM, et al. Effect of ultraviolet on vitamin D and quality of life in postmenopausal women: a randomized controlled study. Physiotherapy Quarterly 2019; 27(3):6-11.
5. Kumru S, Godekmerdan A, Yilmaz B. Immune effects of surgical menopause and estrogen replacement therapy in peri-menopausal women. J Reprod Immunol. 2004; 63(1):31-38.
6. Yumuk V, Tsigos C, Fried M, et al. European Guidelines for Obesity Management in Adults. Obes Facts. 2015; 8(6):402-424.
7. Kerr R, Stirling D, Ludlam CA. Interleukin 6 and haemostasis. Br J Haematol. 2001; 115 (1):3-12.
8. Febbraio MA, Pedersen BK. Contraction-induced myokine production and release: is skeletal muscle an endocrine organ?.Exerc Sport Sci Rev. 2005; 33(3):114-119.
9. Brichory FM, Misek DE, Yim AM, et al. An immune response manifested by the common occurrence of annexins I and II autoantibodies and high circulating levels of IL-6 in lung cancer. Proc Natl Acad Sci U S A. 2001; 98 (17):9824-9829.
10. Stenlöf K, Wernstedt I, Fjällman T, et al. Interleukin-6 levels in the central nervous system are negatively correlated with fat mass in overweight/obese subjects. J Clin Endocrinol Metab. 2003; 88 (9):4379-4383.
11. Ryan AS, Nicklas BJ, Berman DM, et al. Dietary restriction and walking reduce fat deposition in the midthigh in obese older women. Am J Clin Nutr. 2000; 72 (3):708-713.
12. Esposito K, Nappo F, Marfella R, et al. Inflammatory cytokine concentrations are acutely increased by hyperglycemia in humans: role of oxidative stress. Circulation. 2002; 106 (16):2067-2072.
13. Kerksick C, Thomas A, Campbell B, et al. Effects of a popular exercise and weight loss program on weight loss, body composition, energy expenditure and health in obese women. NutrMetab (Lond). 2009; 6:23.
14. Arsenault BJ, Côté M, Cartier A, et al. Effect of exercise training on cardiometabolic risk markers among sedentary, but metabolically healthy overweight or obese post-menopausal women with elevated blood pressure. Atherosclerosis. 2009; 207(2):530-533.
15. Gordon MM, Bopp MJ, Easter L, et al. Effects of dietary protein on the composition of weight loss in post-menopausal women. J Nutr Health Aging. 2008; 12(8):505-509.
16. Roelants M, Delecluse C, Verschueren SM. Whole-body-vibration training increases knee-extension strength and speed of movement in older women. J Am Geriatr Soc. 2004; 52(6):901-908.
17. Schneider HJ, Friedrich N, Klotsche J, et al. The predictive value of different measures of obesity for incident cardiovascular events and mortality. J Clin Endocrinol Metab. 2010; 95(4):1777-1785.
18. Boyd JC, Simpson CA, Jung ME, Gurd BJ. Reducing the intensity and volume of interval training diminishes cardiovascular adaptation but not mitochondrial biogenesis in overweight/obese men. PLoS One. 2013; 8(7):e68091.
19. Grossman JA, Payne EK. A randomized comparison study regarding the impact of short-duration, high-intensity exercise and traditional exercise on anthropometric and body composition measurement changes in post-menopausal women--A pilot study. Post Reprod Health. 2016; 22(1):14-19.
20. Johansson K, Neovius M, Hemmingsson E. Effects of anti-obesity drugs, diet, and exercise on weight-loss maintenance after a very-low-calorie diet or low-calorie diet: a systematic review and meta-analysis of randomized controlled trials. Am J Clin Nutr. 2014; 99(1):14-23.
21. Alvarez-Alvarado S, Jaime SJ, Ormsbee MJ, et al. Benefits of whole-body vibration training on arterial function and muscle strength in young overweight/obese women. Hypertens Res. 2017; 40(5):487-492.
22. Zhang H, Tong TK, Qiu, W,et al. Effect of high-intensity intervaltraining protocol on abdominal fat reduction in overweight Chinesewomen: a randomized controlled trial. Kinesiology2015; 47(1):57-66.
23. Osman DA, Yousef AM, El-Badry S,et al. Impact of moderate exercise on breast milk cortisol in healthy lactating women: A randomized controlled trial. Eurasia J Biosci.2020; 14(1):1113-1117.
24. Ashem HN,Abdelsamea GA, Osman DA,et al. Physical therapy protocol for obese adolescent girls with polycystic ovarian syndrome: A within-subject design. Ann Clin Anal Med.2019; 10(4):496-500.
25. Kwaśniewska M, Pikala M, Kaczmarczyk-Chałas K, et al. Smoking status, the menopausal transition, and metabolic syndrome in women. Menopause. 2012; 19(2):194-201.
26. Trayhurn P, Wood IS. Signalling role of adipose tissue: adipokines and inflammation in obesity. Biochem Soc Trans. 2005; 33(Pt 5):1078-1081.
27. Clifton PM. Diet and C-reactive protein. CurrAtheroscler Rep. 2003; 5(6):431-436.
28. Heilbronn LK, Noakes M, Clifton PM. Energy restriction and weight loss on very-low-fat diets reduce C-reactive protein concentrations in obese, healthy women. ArterioscIerThrombVasc Biol. 2001; 21(6):968-970.
29. Vissers D, Verrijken A, Mertens I, et al. Effect of long-term whole body vibration training on visceral adipose tissue: a preliminary report. Obes Facts. 2010; 3(2):93-100.
30. Delecluse C, Roelants M, Verschueren S. Strength increase after whole-body vibration compared with resistance training. Med Sci Sports Exerc. 2003;35(6):1033-1041
31. Rehn B, Lidström J, Skoglund J, et al. Effects on leg muscular performance from whole-body vibration exercise: a systematic review. Scand J Med Sci Sports. 2007; 17(1):2-11.
32. Weston KS, Wisløff U, Coombes JS. High-intensity interval training in patients with lifestyle-induced cardiometabolic disease: a systematic review and meta-analysis. Br J Sports Med. 2014; 48(16):1227-1234.