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Choreographic Group-Based Fitness Classes Improve Cardiometabolic Health-Related Anthropometric Indices and Blood Lipids Profile in Overweight Sedentary Women

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Abstract: *Background:* Choreographic group-based fitness classes are the most common type of physical activity practiced by women, being a viable and sustainable strategy to improve general health. Thus, the aim of this study was to analyze the effect of a 16-week healthy lifestyle program, based on choreographic fitness classes, on cardiometabolic health-related anthropometric indices and metabolic blood profile among overweight sedentary women. *Methods:* A total of 50 overweight (Body Mass Index = 27.68 ± 1.19 kg/m^2) middle-aged women (39.73 ± 7.41 years) were randomly assigned to an experimental exercise group based on structured choreographic fitness classes (CFC) with the Zumba Fitness program (3 days/week; 60 min/session) (CFC = 30) or a non-exercise control group (CG = 20). The anthropometric indices (waist circumference, waist-to-height ratio, a body shape index, conicity index, abdominal volume index, and body adiposity index), blood pressure, glycemia, and blood lipid profile [triglycerides (TG), total cholesterol, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL)] were evaluated pre- and post-intervention. *Results:* 40 participants competed the pre/post measures. Post-intervention, the CFC group (n = 25) presented a significant improvement in all anthropometric indices as well as in TG, HDL, and LDL as compared with the CG (n = 15). *Conclusion:* A 16-week healthy lifestyle program based on structured choreographic fitness classes with the Zumba Fitness program (3 days/week; 60 min/session) could significantly improve cardiometabolic health-related anthropometric indices and the blood lipid profile in overweight sedentary middle-aged women.

Keywords: adiposity; dance fitness; body composition; metabolic health

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1. Introduction

Overweight and obesity are strongly associated with higher rates of mortality from all causes, as has been shown in a recent study carried out on four continents [1]. Overweight and obesity are defined as abnormal or excessive storage of adipose tissue [2]. They are therefore considered a serious public health problem that can lead to many preventable chronic diseases, mainly with a cardiovascular and metabolic origin, such as diabetes, high blood pressure, heart disease, and stroke, as well as different types of cancer, osteoarthritis and reproductive diseases [3]. According to the WHO (March 2020), in 2016 39% of adults aged 18 years and over (39% of men vs. 40% of women) were overweight, and the prevalence of obesity is expected to increase more rapidly in women [4]. The main factor contributing to overweight and obesity is an energy imbalance between calories consumed and calories expended [5,6]. A higher intake of foods high in fat and sugar, as well as increased physical inactivity due to the sedentary nature of many forms of work, passive modes of transport, long working hours, and stressing daily routines, could be responsible for this energy and metabolic imbalance [7]. Worldwide, the prevalence of physical inactivity is significantly higher in women compared to men (women = 31% to

37% vs. men = 23%) [8]. Therefore, due to the lack of daily physical activity among adult women, there is great concern, especially in Latin-American and Caribbean women, where the prevalence has continued to grow exponentially in the last decades [8]. Additionally, the United Nations Sustainable Development Goals has as its main objective for 2030 to develop sustainable communities by reducing premature mortality from non-communicable diseases by one third through prevention and treatment and promoting mental health and well-being [9]. This fact highlights the need to implement attractive and multidisciplinary physical activity (PA) strategies for the female community, that additionally including nutritional education, in order to improve daily physical activity levels and to ensure optimal cardiometabolic health.

The proliferation of sports fitness centers and group-based fitness classes are a source of PA available to the general population [10]. However, these sports fitness centers are not fully adapted to the entire population. For example, previous studies show how obese or overweight people have problems, such as embarrassment and discomfort, when training individually and without supervision in health clubs [11,12]. As a possible solution, group-based fitness activities were born, as inclusive and cooperative activities that promote movement and improve innumerable health variables in a wide range of the population, including overweight and obese people [13–15]. Within the group-based activities, Zumba Fitness is considered one of the most trending group-based choreographed fitness classes among the female audience today [16–19]. However, despite its popularity, more literature is needed to deeply analyze the effects of this activity in the adult population (with or without weight problems) beyond general benefits, such as quality of life or a feeling of well-being [19]. For instance, given that they involve predominantly aerobic activities, it would be interesting to know the effects of choreographed fitness classes on adiposity and cardiometabolic risk-related parameters, especially in people who are overweight or obese. A possible reason for the lack of studies on this topic could be the fact that group-fitness classes have been relatively recent fitness trends (appearing in the worldwide fitness trends survey for the first time in 2012) [20]. Other possible causes could be the cost, invasive techniques, and high logistics of some instruments to objectively evaluate adiposity and cardiometabolic risk-related variables. In this sense, the measurement of anthropometric indicators is inexpensive and non-invasive, and it is easy to perform as part of a generic medical screening. Accordingly, anthropometric indices such as body mass index (BMI), waist circumference (WC), and waist–height ratio (WtHR) have been shown to be closely related to cardiometabolic risk variables [21–23]. Therefore, they could be used as surrogate markers for estimating body fat and cardiometabolic risk in a simple, non-invasive, and affordable way. At present, new anthropometric indices such as a body shape index (ABSI), conicity index (CI), abdominal volume index (AVI), and body adiposity index (BAI) have begun to be used as estimators of adiposity and predictors of different cardiometabolic diseases and risk of mortality [24–32]. However, there is little evidence of the use of these anthropometric indices to analyze cardiometabolic health outcomes after an intervention based on choreographic group-based fitness classes. Additionally, the metabolic blood profile is a common and viable tool that complements these anthropometric indices to analyze cardiometabolic risk, since it is carried out using a simple blood analysis. For all these reasons, we consider that the use of these anthropometric indices alone or combined with blood parameter markers (i.e., glucose, lipid profile, and blood pressure) could be affordable and reliable instruments for the early detection of cardiometabolic diseases. Thus, the aim of this study was to analyze the effect of a 16-week healthy lifestyle program, based on choreographic fitness classes, on cardiometabolic health-related anthropometric indices and metabolic blood profile among overweight sedentary middle-aged women.

2. Materials and Methods

2.1. Study Design, Participants, and Procedures

This study is part of the "For a healthy university project", which was a research project based on analyzing the effect of different exercise interventions combined with nutritional education sessions on several health variables in the sedentary university worker community of Riobamba, Ecuador. The project was approved by the National University of Chimborazo Research Committee (29-CI-2014-10-17-22). All procedures were carried out following the rules of the Declaration of Helsinki of 1975 (https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/), revised in 2013. All participants were informed about the aims of the study, and they provided their informed consent prior to participation. During the participants' recruitment for this project, approximately 950 university workers were invited to participate in the project through their corporative email addresses. A total of 148 women attended the initial information meeting, but only 120 met the inclusion criteria (apparently healthy, inactive adult women from 25 to 50 years old, i.e., <150 min of physical activity/week, no diagnosed diseases, no medications, and university workers with mainly sedentary tasks as part of their occupation, i.e., >6 h sitting). A total of 98 participants attended to the initial evaluation. They were randomly assigned to the study groups of the project: (1) control group: without exercise intervention, n = 33, (2) intervention group 1: with Zumba Fitness classes, n = 33, and (3) intervention group 2: with Zumba Fitness classes plus 20 min of additional bodyweight exercise, n = 32.

A post hoc secondary analysis of the project "for a healthy university" is presented in this study. In the present study, only a subsample of overweight women (BMI > 25 kg/m^2) was selected, where 43 participants were excluded due to the BMI criterion. Overweight women mainly belonged to group 1 (control group, n = 20) and group 2 (Zumba Fitness classes without additional bodyweight exercise, n = 30); group 3 (only with five overweight women) was excluded for this secondary analysis. Finally, a total of 50 overweight women were selected which were assigned to the intervention group of choreographic fitness classes with the Zumba Fitness program (CFC = 30) or to the control group with a non-exercise intervention (CG = 20).

As the general procedure for the pre- and post-intervention assessments, participants were analyzed at the Medical Department of the Faculty of Health Sciences of the National University of Chimborazo (Ecuador), in fasting conditions and with no exercise in the last 24 h, in order to evaluate the anthropometric indices related to adiposity and cardiometabolic health, blood pressure, and blood lipid profile.

2.2. Cardiometabolic Health-Related Anthropometric Indices

The anthropometric assessment was performed following the procedures described by the International Society for the Advancement of Kinanthropometry (ISAK) by a certified researcher (ISAK level II) who was blinded to the participants' group.

The body mass index (BMI) was calculated in kg/m^2 from the measured weight and height [33]. The waist to height ratio (WtHR) is a measure of the distribution of body fat. Higher values of WtHR are associated with a higher risk of abdominal obesity-related cardiovascular diseases [25]. The WtHR was calculated by dividing waist circumference (WC) by height, both in the same unit. A value above 0.49 was considered a risk value for women [25]. A body shape index (ABSI) is an anthropometric measure independent of BMI that takes into account a given body weight, height, and WC to evaluate central obesity and its clinical implications, such as the risk of mortality [26]. For this study, the ABSI was calculated as ABSI = WC (m)/(BMI$^{2/3}$(kg/m^2) * Height$^{1/2}$ (m)). Recently, It has been found that ABSI achieves better mortality risk stratification than alternative indices of abdominal obesity [26]. A value above 0.0775 was considered a high mortality risk for women [26]. The conicity index (CI) is a simple anthropometric measure to assess central adiposity and was created by Valdez et al. (1993) [27]. Currently, CI is considered a useful abdominal index for detecting visceral obesity and has been studied as a predictor for metabolic risk alterations (fasting insulin, blood pressure, and triglyceride levels) [28]. In this study, CI was calculated as CI = WC (m)/0.109 $\sqrt{}$ weight (kg)/height (m) [29,30]. Values of CI above 1.18 are related to metabolic dysfunction in women [31].

The abdominal volume index (AVI) is another anthropometric index that estimates the adipose tissue in viscera and abdominal organs. The AVI is frequently used to identify metabolic abnormalities. AVI was calculated as AVI = [2 (waist (cm))^2 + 0.7 (waist (cm) − hip (cm)^2)]/1000. The optimal cut-off point of AVI for discriminate metabolic disorders in women is 17.3 [30,34].

The body adiposity index (BAI) is an anthropometric measure to estimate the percentage of body fat (PBF) in humans, using hip circumference and height. BAI was calculated as BAI = ((hip circumference)/((height)$^{1.5}$) − 18). The BAI can be used to reflect PBF for adult men and women of different ethnicities without numerical correction [32]. The PBF categories for women are as follows: athletes (8–15%), fitness/good (16–23%), acceptable (24–30%), overweight (31–36), obese (>37%) [35].

2.3. Blood Parameters

2.3.1. Arterial Blood Pressure

Arterial blood pressure as systolic blood pressure (SBP) and diastolic blood pressure (DBP) was measured by trained nursing staff using a sphygmomanometer (no-digital kit-arm) and a stethoscope (Riester, Germany). The participants remained seated for 5 min before and during the measurement. Healthy values of blood pressure were established: SBP < 120 mmHg and DBP < 80 mmHg; values exceeding these levels were considered unhealthy or elevated blood pressure.

2.3.2. Blood Analysis

A total of 3 mL of blood was drawn from the antecubital vein by qualified nursing staff. Plasma was extracted after blood centrifugation at 3500 rpm for 15 min at 4 °C (Centrifugal Hettich, 12 EBA, Tuttlingen, Germany). The samples of plasma were analyzed by spectrophotometry (spectrophotometer Humalyzer 3500, Human diagnostic, Wiesbaden, Germany) to evaluate the concentration of glucose, triglycerides, total cholesterol, High Density Lipoprotein, and Low Density Lipoprotein. The risk normative values of this concentration related to cardiometabolic alterations were: glucose ≥ 100 mg/dL, triglyceride ≥ 150 mg/dL, total cholesterol ≥ 200 mg/dL, HDL < 50 mg/dL, and LDL > 130 mg/dL.

2.4. Intervention

Participants from the experimental group (CFC) received a 16-week exercise intervention based on choreographic structured fitness classes of Zumba Fitness, three times a week, 60 min each session. Classes were live and led by a professional Zumba instructor (ZIN member). The Zumba Fitness classes presented the following structure: warm-up (5–10 min), main part (40–45 min), and cool down (5–10 min). The Zumba Fitness combined different choreographies during the session, mainly derived from Latin rhythms. Normally, two music tracks were used for the initial warm-up, with choreographies based on joint mobility and flexibility, both static and dynamic, as well as basic steps and movements of dance aerobic with basic displacements (music rhythm between 120 and 135 bpm). During the main part, six to eight music tracks of different Latin rhythms were played, with corresponding dance steps such as merengue, salsa, cumbia, reggaeton, etc. This part was characterized by an alternation of the music velocity (bpm and quality of the movements ((heavy/light, strong/soft, sudden/sustained, direct/indirect) as well as varying complexity of the coordination needed for the choreographic steps. Finally, during cool down, two relaxing music tracks, such as bachata, kizomba, etc., were used for returning to calm through dynamic stretching and breathing movements. In this intervention, the choreographies of the official Zumba ZIN DVDs (numbers 48 and 50), were implemented. Attendance to exercise sessions was registered on a sheet by the participant's signature. The intensity of the sessions was registered after each session using the rating of perceived exertion (RPE) through the Borg scale (0–10). Control group participants did not receive the exercise intervention and continued with their habitual lifestyle. Additionally, during the intervention period, participants, both in the CFC group and the CG, received two sessions (during the first and eighth week of the intervention) on nutritional education by a professional nutritionist; these sessions consisted of recommendations for adopting healthy nutritional habits.

2.5. Statistical Analysis

For quantitative variables, data are expressed as mean ± standard deviation (SD) or mean differences (MD) ± SD, whereas frequency and percentage were used for expressing qualitative variables. The normality of distribution was assessed with the Kolmogorov–Smirnov test, and the homogeneity of the variable was assessed using the Levene test. The mean differences pre- and post-intervention within the study groups were analyzed using a student's *t*-test for variables with a normal distribution and using the Wilcoxon test for variables with a non-normal distribution. An Analysis of Covariance (ANCOVA test) was used to compare the mean differences between the experimental and control groups after intervention using baseline levels and age as covariables. The effect size of intervention was measured by Cohen d (d) (low effect size d =< 0.5, medium effect size d = 0.5 to 0.8, high effect size $d > 0.8$), and eta partial squared (ηp^2) was used for the variance interpretation. The study variables were categorized as risk or not risk according to the cut-off points described in the methods section. All statistical analyses were performed with the software SPSS 26.0 of IBM SPSS (Armonk, NY, USA), establishing the significance level at $p < 0.05$.

3. Results

Characteristics of the sample at baseline are presented in Table 1. The study sample was composed mainly of middle-aged women (39.73 ± 7.41 years). The general sample presented an average value of waist circumference considered as a risk value (over 85 cm); in fact, more than half of the sample presented as a risk value (52.0%). Similar results were found for WtHR, CI, and BAI, for which the general sample showed a risk value (>0.49, >1.18, and >30%, respectively). Concretely, 84%, 66%, and 64% of the sample presented a risk value for these respective measures. Related to blood parameters, the means of the study variables did not present any risk value in the overall study sample. However, some participants presented risk values when they were individually analyzed. Specifically, the variables of HDL, triglycerides, and total cholesterol could be highlighted, since the percentage of participants with risk values was 94%, 36%, and 30%, respectively.

Table 1. Characteristics of the sample at baseline.

n = 50	M	SD	Risk		No risk	
			n	%	n	%
Age	39.73	7.411				
Athropometric measures						
Body Weight (kg)	67.57	11.01				
Height (m)	1.56	0.10				
BMI (kg/m^2)	27.68	3.19				
Hip circumference (cm)	100.58	6.60				
Anthropometric indexes						
WC (cm)	85.92	10.94	26	52	26	52
WtHR	0.55	0.10	42	84	42	84
ABSI	0.074	0.006	9	18	9	18
CI	1.20	0.12	33	66	33	66
AVI	15.19	3.88	9	18	9	18
BAI (%)	34.02	9.38	32	64	32	64
Blood parameters						
SBP (mmHg)	116.04	12.69	40	80	40	80
DBP (mmHg)	66.23	8.20	2	4	2	4
Fasting blood gucose (mg/dL)	82.70	10.45	1	2	1	2
Triglycerides (mg/dL)	134.33	45.92	18	36	18	36
Total Cholesterol (mg/dL)	175.48	43.21	15	30	15	30
HDL (mg/dL)	41.6	6.4	48	96	48	96
LDL (mg/dL)	103.31	35.66	40	80	40	80

Data are expressed as mean (M) and standard deviation (SD). Data expressed as frequency and percentage. WC = waist circumference; WtHR = waist-to-height ratio; ABSI = a body shape index; CI = conicity index; AVI = abdominal visceral index; BAI = body adiposity index; SBP = systolic blood pressure; DBP = diastolic blood pressure; HDL = high density lipoprotein; LDL = low density lipoprotein.

A total of 40 participants completed pre- and post-intervention measurements (CG = 15 and CFC = 25) with a drop-out rate of 16.7% (5 participants from each study group). The CFC group presented an attendance of > 80%, with an RPE = 7.3 ± 0.4. The nutritional session attendance was high (Session 1: CG = 100% and CFC = 100%; Session 2: CG = 96% and CFC = 98%). Both groups maintained similar nutritional habits during the intervention, with a significant reduction only in the case of milk intake (T0 = 258.31 ± 149.27 mL versus T1 = 192.25 ± 147.99, p = 0.043). Changes in anthropometric indices related to adiposity and blood parameters are presented in Table 2. The CFC group presented significant improvement in the majority of the anthropometric indices, concretely in WC (MD = −2.934 ± 4.75 cm; p = 0.005), WtHR (MD = −0.024 ± 0.03; p = 0.001), AVI (MD = −0.983 ± 1.44785; p = 0.002), and BAI (MD = −1.920 ± 1.657; p < 0.001). However, the CG showed significant detriment in all anthropometric indices except the BAI, where no statistical change was observed. In relation to the blood variables, for the CFC group a positive improvement was observed in the majority of the parameters and mainly in the blood lipid profile (triglycerides: MD = −19.32 ± 26.64 mg/dL; p = 0.001; total cholesterol: MD = −65.00 ± 40.45 mg/dL; p < 0.001; LDL: MD = −3.305 ± 5.46 mg/dL; p = 0.008). The CG presented significant detriments for the blood concentration of triglycerides (MD = +20.2 ± 21.55 mg/dL) and LDL (MD = +7.65 ± 8.31 mg/dL). No significant changes were observed for the rest of blood parameters for the CG.

Table 2. Anthropometric indices and blood parameters before and after intervention in study groups.

	Control Group (CG) n = 15					**Choreographic Fitness Classes Group (CFC) n = 25**				
Variables	**Pre-Intervention**		**Post-Intervention**		**p Value**	**Pre-Intervention**		**Post-Intervention**		**p Value**
	M	**SD**	**M**	**SD**		**M**	**SD**	**M**	**SD**	
Anthropometric indices										
WC (cm)	82.19	6.37	84.97	5.84	0.000	83.79	11.34	80.86	10.84	0.005
WtHR	0.52	0.04	0.53	0.04	0.006	0.54	0.070	0.52	0.070	0.001
ABSI	0.073	0.004	0.078	0.051	0.002	0.073	0.005	0.072	0.006	0.752
CI	1.17	0.07	1.23	0.05	0.001	1.170	0.10	1.15	0.09	0.303
AVI	13.76	2.01	14.66	1.93	0.000	14.53	3.96	13.55	3.65	0.002
BAI (%)	30.62	3.52	31.14	4.08	0.089	33.92	3.51	32.00	3.51	0.000
Blood parameters										
SBP (mmHg)	118.21	10.49	118.57	14.06	0.890	117.00	14.43	110.40	14.57	0.004
DBP (mmHg)	68.93	7.38	71.07	9.44	0.254	65.00	9.24	64.20	8.12	0.672
Glucose (mg/dL)	89.87	7.56	89.36	8.72	0.817	78.58	8.13	86.04	11.48	0.015
Triglycerides (mg/dL)	140.44	39.63	160.64	36.85	0.004	126.72	47.56	107.40	35.13	0.001
Total-Cholesterol (mg/dL)	182.95	51.61	169.79	48.52	0.193	171.28	37.95	155.08	34.50	0.000
HDL (mg/dL)	39.15	3.48	36.00	5.58	0.061	44.80	7.48	46.87	8.04	0.151
LDL (mg/dL)	103.43	38.66	111.08	34.19	0.006	101.59	33.27	98.29	30.94	0.008

Data are expressed as mean (M) and standard deviation (SD). WC = waist circumference; WtHR = waist-to-height ratio; ABSI = a body shape index; CI = conicity index; AVI = abdominal visceral index; BAI = body adiposity index; SBP = systolic blood pressure; DBP = diastolic blood pressure; HDL= high density lipoprotein; LDL= low density lipoprotein.

Comparisons between CFC and CG post-intervention are presented in Figure 1 for the anthropometric indices and in Figure 2 for blood parameters. The CFC group presented significant improvement post-intervention in all anthropometric indices compared with the control group. The values of the waist circumference (WC), waist-to-height ratio (WtHR), body shape index (ABSI), conicity index (CI), abdominal volume index (AVI), and body adiposity index (BAI) were significantly reduced in the CFC group compared with the CG (WC: MD = 4.113 ± 8.342 cm, p < 0.001, d = 0.70, ηp^2 = 0.341; WtHR: MD = 0.014 ± 0.052, p < 0.001, d = 0.36, ηp^2 = 0.306; ABSI: MD = 0.005 ± 0.004, p = 0.001, d = 0.10, ηp^2 = 0.248; CI: MD = 0.072 ± 0.073, p = 0.001; d = 1.42, ηp^2 = 0.263; AVI: MD = 1.119 ± 2.787, p < 0.001, d = 0.58, ηp^2 = 0.381; BAI: MD = 1.142 ± 4.005, p < 0.001, d = 0.21, ηp^2 = 0.392).

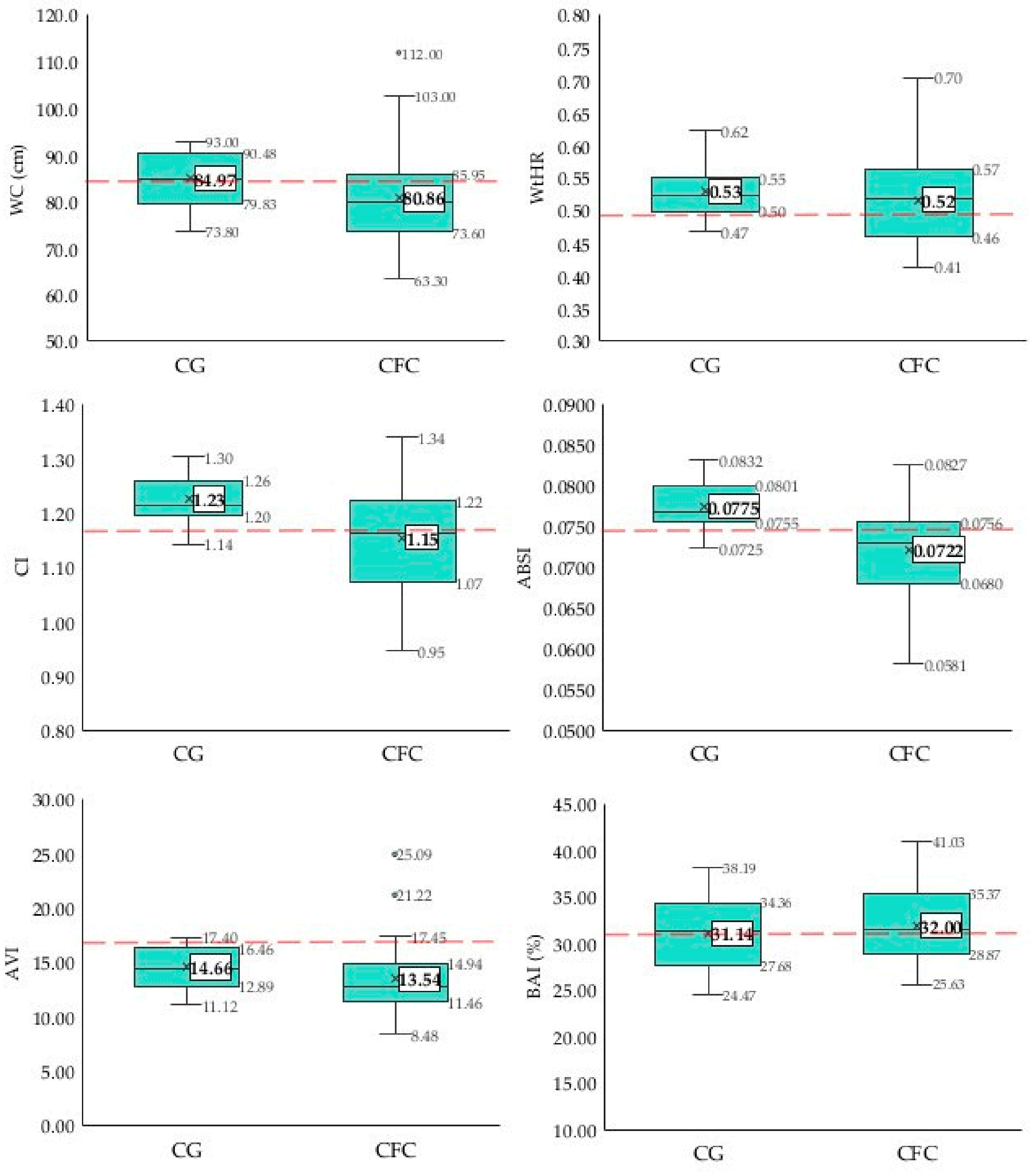

Figure 1. Anthropometric indices after intervention. Intermittent red line indicates the mean risk value of each anthropometric index. WC = waist circumference; WtHR = waist-to-height ratio; ABSI = a body shape index; CI = conicity index; AVI = abdominal volume index; BAI = body adiposity index.

After intervention, the CFC group significantly improved the values of SBP, triglycerides (TG), HDL, and LDL compared with the CG. The SBP, TG and HDL significantly decreased after intervention compared with the CG and with mean values below the risk cut-off points (SBP: MD = 8.171 ± 14.318 mmHg, $p = 0.037$, d = 0.58, $\eta p^2 = 0.116$; TG: MD = 53.243 ± 35.997 mg/dL, $p < 0.001$, d = 1.44, $\eta p^2 = 0.541$; LDL: MD = 12.797 ± 32.565, $p < 0.001$, d = 0.37, $\eta p^2 = 0.498$). The HDL blood concentration significantly increased in the CFC group compared with the control group; however, the HDL mean did not reach the healthy cut-off point, though it was close (HDL: MD = 10.877 ± 6.810 mg/dL, $p = 0.004$, d = 1.95, $\eta p^2 = 0.232$).

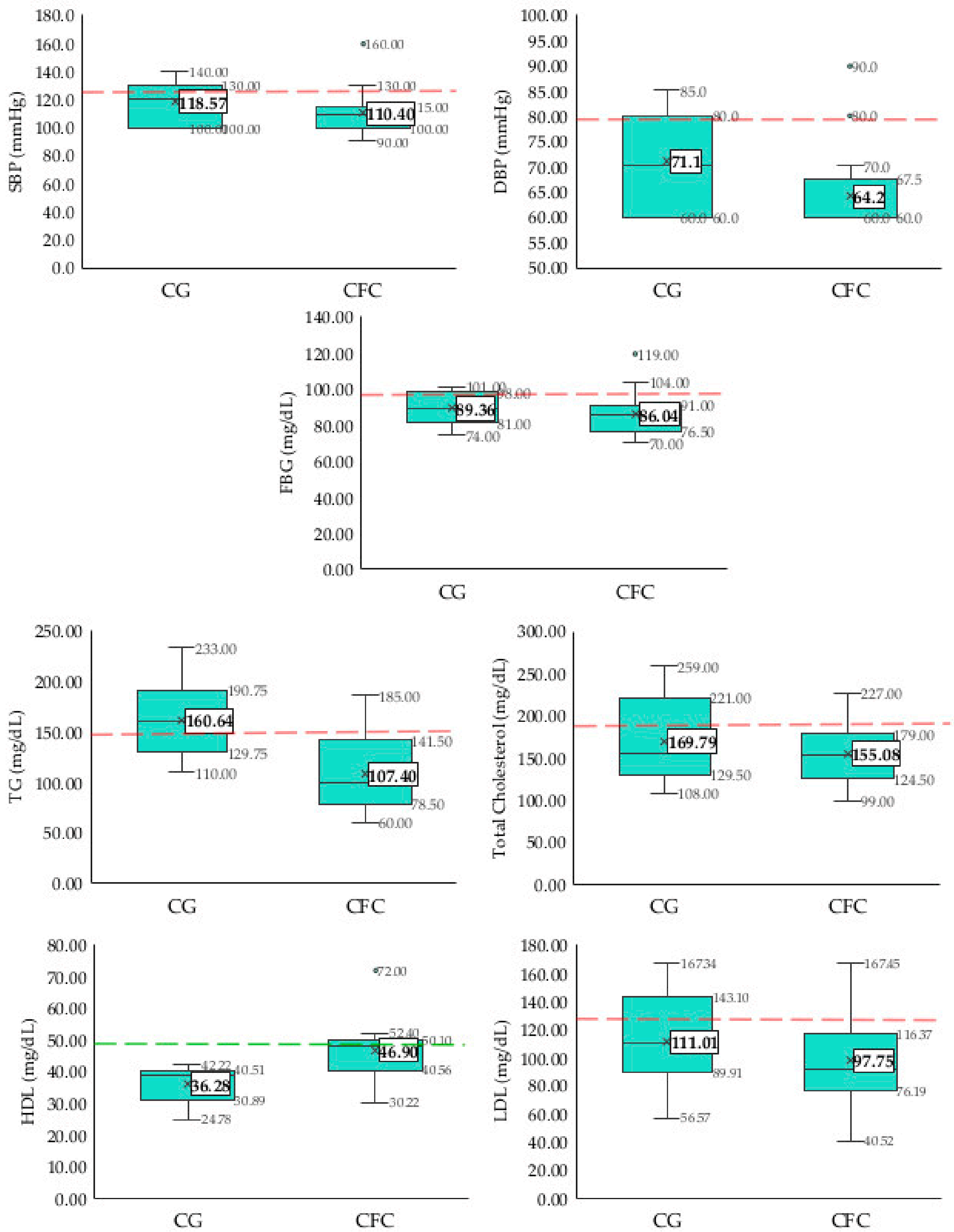

Figure 2. Blood parameters after intervention. Intermittent red line indicates the cut-off point for risk value of each anthropometric index; green intermittent line indicates the healthy mean cut-off point. SBP = systolic blood pressure; DBP = diastolic blood pressure; FBG = fasting blood glucose; TG = triglycerides; HDL = high density lipoprotein; LDL = low density lipoprotein.

Figure 3 shows the changes in the risk prevalence of the anthropometric indices after intervention, expresses as percentages. No significant change was observed within the study group between pre- and post-intervention. However, the CFC group presented an increased percentage of participants with no risk values in the majority of the indices (WC, WtHR, CI, and BAI) compared with the CG, which presented a detriment in the percentage of participants with healthy values in all indices.

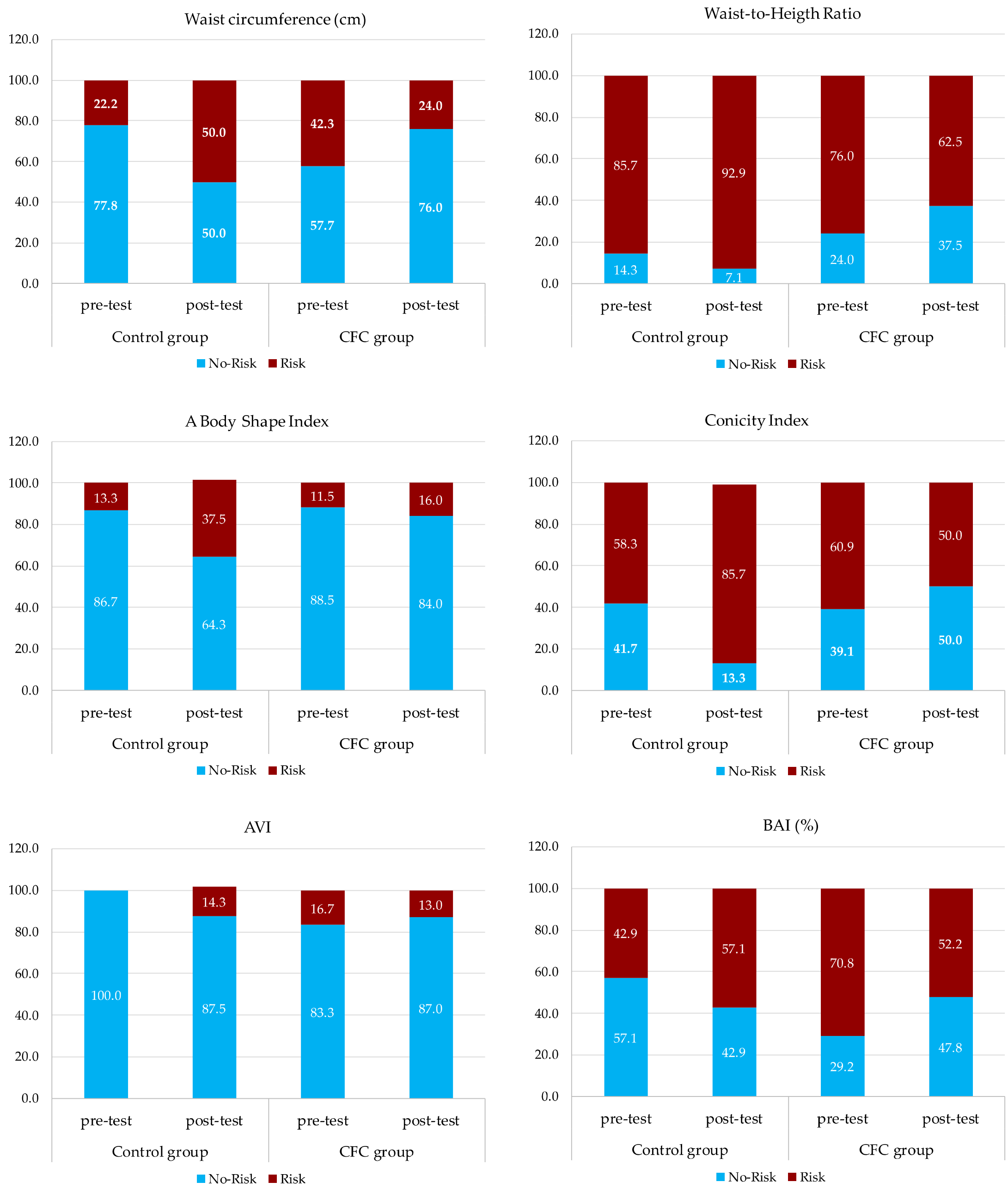

Figure 3. Changes in the risk value prevalence of the anthropometric indices (%) after the intervention. AVI = abdominal volume index and BAI = body adiposity index.

No significant changes were observed from pre- to post-intervention in the categories of risk within the study group according the blood parameters analyzed (Figure 4). However, the CFC group presented an increment in the percentage of the participants with no risk category in the case of TG, TC, and HDL compared with the CG, which only softly increased this percentage for TC.

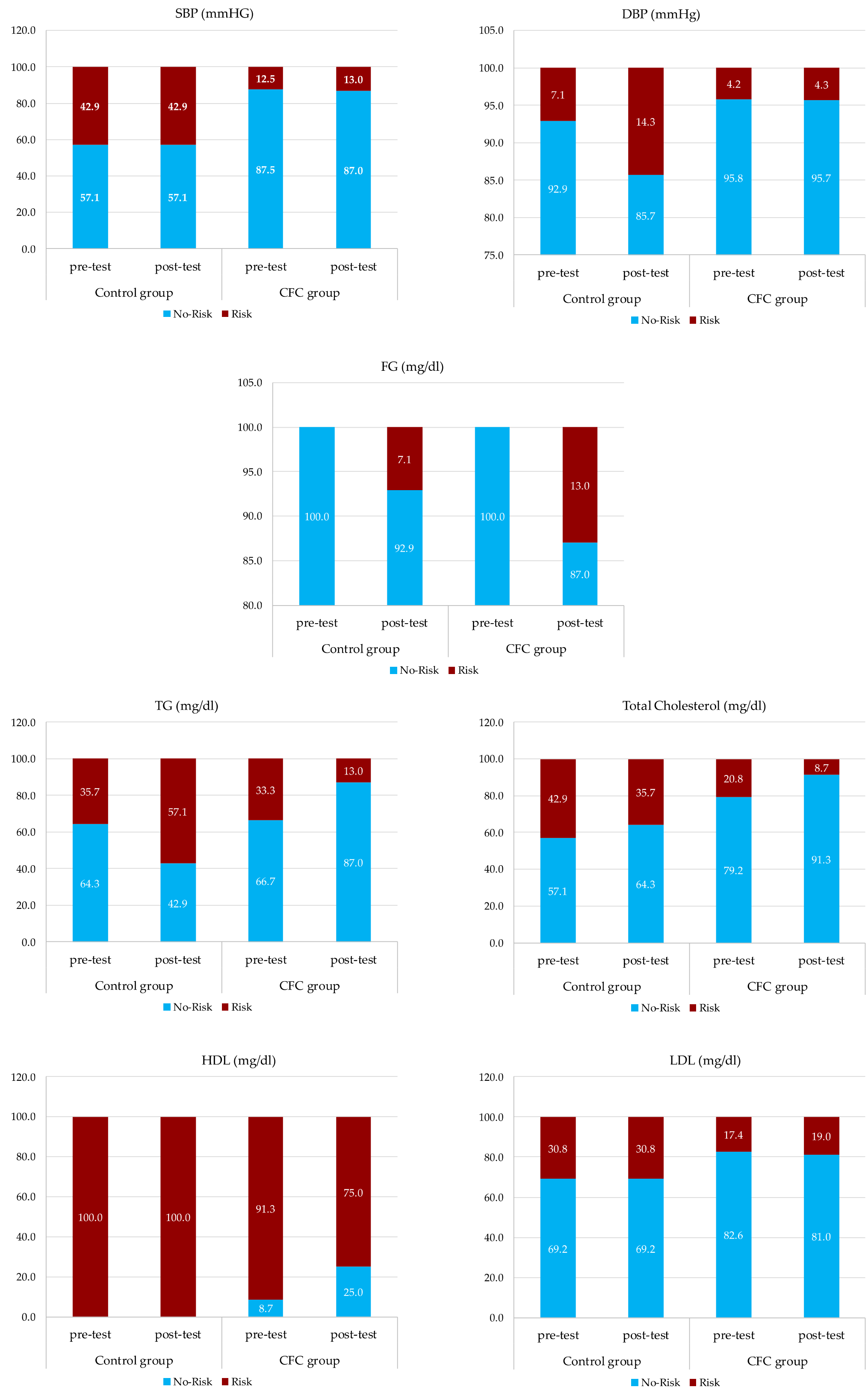

Figure 4. Changes in the risk value prevalence of the blood parameters (%) after the intervention. AVI = abdominal volume index; BAI = body adiposity index; SBP = systolic blood pressure; DBP = diastolic blood pressure; FBG = fasting blood glucose; TG = triglycerides; HDL = high density lipoprotein; LDL = low density lipoprotein.

4. Discussion

The main findings of this study were that a 16-week healthy lifestyle program based on structured choreographic fitness classes with the Zumba Fitness program significantly improved the cardiometabolic health-related anthropometric indices and blood lipid markers (triglycerides, HDL, and LDL) in overweight women compared with a control group. Therefore, it seems that the promotion of trending physical activity strategies for overweight women, such as choreographic fitness classes, can be a viable and effective initiative to protect their health, improving the sustainability of the public health system.

It should be noted that obesity-related anthropometric indices such as those measured in this study could be important tools for the early detection of obesity-related cardiometabolic diseases. The obesity-related anthropometric indices could be used in routine practice in an economic and affordable way, since their positive association with risky blood lipid levels and the development of cardiometabolic diseases has been widely demonstrated [36,37]. During the last decade, several studies have analyzed the effect of choreographic fitness class interventions like Zumba Fitness on health-related anthropometric indices and body composition variables [19,38–53]. Most of these showed significant improvements in body composition variables, such as body weight and estimated percentage of total or partial body fat mass, independently of the intervention duration (from 8 to 40 weeks) and measurement method used [41–43,45,46,48,50,51,54], with notable improvements shown particularly in studies developed for the overweight and obese female population [41,45,46]. However, there are few studies based on Zumba Fitness interventions that analyzed health-related anthropometric indices, concretely in the overweight/obese population [41,45,46,49,52,53]. Additionally, the most common health-related anthropometric indices used are body mass index (BMI), waist circumference (WC), hip circumference (HC), arm circumference (AC), and waist-hip Index (WHI). Improvements were observed in BMI [45,52,53], WC [45,46], and WHI [41], whereas in some studies no improvements were found for BMI [40,41]. In our study, WC was also used as a health-related anthropometric index, with similar improvements compared with previous comparable studies in overweight/obese women [45,46]. These studies had a duration/frequency similar to our study, from 12 to 16 weeks, of Zumba Fitness intervention with two to three sessions per week. In our study, WC was reduced by 2.9 cm in the group with the Zumba fitness program after the intervention, and by 4.14 cm in comparison with the control group, whereas in the studies previously mentioned, a reduction of 3.8 cm was observed without control group after the intervention. However, to our knowledge, there are no studies to date that analyze the effect of this type of intervention on cardiometabolic health-related anthropometric indices such as ABSI, AVI, WtHR, and BAI, as in our study.

Regarding the blood parameters in our study, the systolic blood pressure, triglycerides, HDL, and LDL concentrations showed significant improvements after the intervention in the Zumba Fitness program group compared with the CG. No significant changes were observed in blood pressure and blood lipid profile after Zumba Fitness interventions in the literature [42,45,46,50,51]. Only in the study of Araneta et al. [49], the triglycerides concentration significantly decreased after a 12-week Zumba Fitness intervention (−17.93 mg/dL). In our study, a similar decrease of 19.32 mg/dL was observed. Similarities with the Araneta et al. results could be explained by the fact that the study populations were similar (Araneta et al. = overweight women with metabolic syndrome; the present study = overweight women). A similar intervention study based on a structured aerobic dance program in obese women also observed improvement in serum triglyceride levels (16.3%) as well as total cholesterol levels (10.1%) [55]. However, it is important to note that our study, as well as the study of Andersen et al. [55], included a combined exercise program plus nutritional guidelines, which are essential to prevent and improve metabolic health, especially in risk populations. Therefore, it is important to highlight the need to apply multidisciplinary interventions that address healthy habits of physical activity and nutrition to obtain clinically positive results in obese middle-aged women [56]. Furthermore, the exercise program's supervision must be carried out by qualified professionals to safeguard the correct application and adaptation of the intervention to the clinical study populations (e.g., for overweight/obese women) [57,58]. Unlike the previously mentioned studies based on choreographic group-based fitness classes, in our study, improvements in HDL-c concentration were observed in the CFC group post-intervention (+2.07 mg/dL), which were very similar to those reported in the meta-analysis of Kodama et al., 2007, about aerobic exercise effect on lipoproteins [59]. However, the healthy cut-off point of this lipoprotein was not reached in the CFC group after the intervention. For that goal, a high increase of HDL (above 5 mg/dL) would have been necessary. Some aspects could explain the limited improvement of HDL in the exercise group. For example, there was a higher percentage of women of menopause age in the CFC group compared with the CG (CFC = 34.4% vs CG = 20.8%). The hormonal changes that accompany the transition to menopause (reduction in estrogen, testosterone, and sex hormone-binding globulin levels) have a notable impact on lipid metabolism, and consequently, on cardiovascular function [60]. Notwithstanding, the impact on HDL-c in pre- and post-menopausal women is still controversial [61]. In addition, the menstrual cycle also could affect HDL-c [62]; however, it was not controlled in this study. Greater improvements in HDL related to aerobic exercise seem to be associated with high total cholesterol concentrations (over 220 mg/dL) [59], and the CFC group showed total cholesterol concentrations below 220 at both pre- (171.28 mg/dL) and post-intervention (155.08 mg/dL). Finally, no improvement in the nutritional habits during the study could affect the concentration of this lipoprotein independently of the exercise-related effect. Two sessions of nutritional education, as took place in this study, could be a starting point to combat the HDL deficit in overweight middle-aged women; however, a more extensive, controlled, and specific nutritional intervention should be proposed, particularly in a context like Ecuador where the diet is generally rich in poly-unsaturated fats and carbohydrates (high consumption of rice, bread, fatty cheese, fatty pork, refined oils, etc.). A nutritional intervention that contributes to increasing the intake of vitamin D, omega-3 fatty acids, antioxidants, and phytochemicals would be adequate, especially in women in menopause transition and postmenopausal women [63], in combination with an exercise intervention based on moderate-to-vigorous continuous aerobic exercise.

The present study has some limitations and strengths. On one hand, the present study presented a secondary and subsample post hoc analysis; for that reason, the study sample is not very large, but similar or even larger than those used in previous analogous studies. The general sample was selected for convenience, but the assignment of the study groups was randomized. On the other hand, the most current, simple, inexpensive, and easily applied anthropometric indices were analyzed for the early detection of possible cardiometabolic diseases, thus ensuring the sustainability of cardiometabolic health in middle-aged overweight/obese women. Additionally, the effect of an exercise intervention based on a popular fitness trend among the female sector that has not been widely studied so far was analyzed. The intervention had a drop-out rate <25%, (16%; 5 persons in each group with justified causes), when a drop-out above 25% is considered fatal in public health intervention studies [64]. The adherence to exercise intervention was high (>80%), which denotes the suitability of this type of physical activity modality among the female population to guarantee the practice's sustainability and its effects on cardiometabolic health in the future. For future, more extensive evaluations, it is important to take into account that cardiorespiratory fitness (VO_2max) also represents a useful marker to evaluate improvement in oxidative metabolism and lipid profile, and its objective evaluation is recommended if feasible.

5. Conclusions

Cardiometabolic health-related anthropometric indices and blood lipids profile improved after 16 weeks of choreographic group-based fitness classes based on the Zumba Fitness program (3 times/week; 60 min/session) combined with nutritional guidelines for overweight middle-aged women. Group-based fitness activities among the female sector should be studied in greater depth. The application of these feasible anthropometric indices could assist with the early detection of cardiometabolic diseases in middle-aged overweight women, which may guarantee optimal sustainability of the public health system.

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