SCIENTIFIC JOURNAL
CEREM-GO

DOI 10.37951/2675-5009.2026v7i19.193
ISSN 2675-5009
e26193
SCIENTIFIC ARTICLE - ORIGINAL

IMPACT OF STRUCTURED CARDIOMETABOLIC INTERVENTION IN A HIGH-RISK CARDIOVASCULAR POPULATION: RESULTS OF A PILOT STUDY

MARCELO JOSÉ LINHARES[1,2], CAMILA PASSOLD[1], LARIANA STEFANELLO[1], BIANCA FERRETTI BERTOTTI[1], LAYLA BALTOR BARBOSA DOS SANTOS[1], JAQUELINE APARECIDA ALMEIDA SPADARI[3], GIULLIANO GARDENGHI[3,4]

1. Instituto Brasileiro de Cardiometabolismo - Blumenau - Santa Catarina – Brazil.
2. Hospital Unimed Blumenau - Blumenau - Santa Catarina – Brazil.
3. Hospital e Maternidade São Cristóvão – São Paulo – São Paulo– Brazil.
4. Hospital ENCORE - Aparecida de Goiânia - Goiás – Brazil.

ABSTRACT

Introduction: Cardiometabolic risk is associated with the likelihood of cardiovascular system damage when multiple factors occur concurrently. These include visceral obesity, dyslipidemia, hypertension, insulin resistance, and inflammation—aspects that comprise the pathophysiology of cardiometabolic diseases. Pharmacological and non-pharmacological interventions seek to control these factors and improve clinical outcomes. **Objective:** This study aims to demonstrate the effect of a multidisciplinary care intervention focused on adjusting cardiometabolic risk factors in a population with a high cardiovascular risk profile. **Methods:** This is a pilot cohort study conducted in a specialized outpatient clinic (cardiologist, endocrinologist, and nutritionist). Individuals underwent a systematic approach involving laboratory tests, cardiovascular risk imaging, and bioimpedance for body composition analysis. Dietary patterns, metabolic activity, and preexisting diseases were established. The protocol included a diet (caloric restriction), protein supplementation, resistance training, and gradual pharmacological treatment. Following the cardiometabolic diagnosis, an intervention plan was devised with structured feedback and follow-ups every 90 days via an app and direct contact with the team. Monitoring lasted six months, with constant reevaluations and adjustments. Statistical analysis was performed using Student's t-test $p \leq 0.05$), with data expressed as mean ± standard deviation. **Results:** Twenty-seven individuals were followed (age: 54.2±8.2 years, 59.3% male, weight: 100.0±15.4 kg). The initial prevalence of risk factors was: coronary artery disease: 51.9%, diabetes: 33.3%, hypertension: 14.8%, dyslipidemia: 88.9%. 92.6% of the sample was specific to body weight, with a pre-test BMI of 34.9±4.3 kg/cm² vs. post-test 31.1±7.6 kg/cm² (p: 0.03). Bioimpedance analysis showed a decrease in fat mass (pre: 39.6±6.7% vs post 35.8±6.4%, p: 0.05) and maintenance of lean mass (pre: 34.0±4.5% vs post 36.1±4.0%, p: 0.10). LDL cholesterol decreased (pre: 96.3±49.4 mg/dL vs post 65.6±39.9 mg/dL, p: 0.03). The same occurred with triglycerides (pre: 199.3±139.0 mg/dL vs post 111.9±69.7 mg/dL, p: 0.01). Fasting glucose, glycated hemoglobin (HbA1c), high-density lipoprotein (HDL), and abdominal diseases did not show significant changes. Statins were used in 77.8% of cases and GLP-1 agonists in 40.7%. **Conclusion:**

Preliminary data suggest that a care program focused on cardiometabolism has high potential to alter risk-associated parameters. Longer follow-up is necessary to determine long-term adherence and the reduction of clinical events.

Keywords: Cholesterol, Cardiometabolic risk factors, Treatment adherence and compliance, Obesity, Weight loss.

INTRODUCTION

Cardiometabolic diseases represent one of the greatest public health challenges in Brazil, ranking among the leading causes of mortality and requiring continuous attention from health authorities.[1] This group of pathologies, which includes systemic arterial hypertension (SAH) and diabetes mellitus (DM), has shown a sustained growth trend in recent decades; epidemiological data indicate that the prevalence of hypertension increased from 53.1% to 66.7% in certain population groups, while diabetes rose from 16.7% to 25% in the same period.[1] Such conditions are often aggravated by modifiable risk factors, such as physical inactivity and smoking, in addition to anthropometric variables, in which individuals with a body mass index (BMI) greater than 27 kg/m² demonstrate a greater probability of developing unfavorable outcomes.[1]

The clinical understanding of these pathologies has evolved into the concept of Cardiometabolic Risk, which recognizes the profound interconnection between obesity, dyslipidemia, and insulin resistance.[2] Recently, Cardiorenal Metabolic Syndrome (CRMS) has emerged as a clinical entity that integrates these factors, highlighting that chronic kidney disease acts as an independent and synergistic cardiovascular risk factor.[2] The redefinition of obesity has also become crucial, shifting the focus beyond body mass index (BMI) and prioritizing the assessment of visceral fat and functional metabolic health, which makes it possible to identify high-risk patients who might previously have been neglected by superficial assessments.[2]

Additionally, cardiometabolic health must be analyzed from the perspective of the life cycle, especially in the female population, which faces specific windows of vulnerability.[3] Hormonal transitions, such as menopause, in addition to conditions such as polycystic ovary syndrome and gestational complications, are early markers that increase the risk of atherosclerosis and hypertension.[3] These biological and sociodemographic particularities require healthcare professionals to adopt a personalized view, recognizing that a woman's risk profile may be shaped by reproductive and hormonal events that occurred decades before the clinical diagnosis.[3]

To address this complexity, current therapeutic management includes promising pharmacological innovations, such as SGLT2 inhibitors and GLP-1 agonists, which offer benefits ranging from glycemic control to direct renal and cardiovascular protection.[2] However, isolated treatment is not sufficient for the sustained reduction of morbidity and mortality; non-pharmacological strategies, centered on lifestyle changes and nutritional interventions, continue to be the foundation for primary prevention and the control of chronic diseases.[1,2] The success of these measures depends directly on the capacity of the healthcare system to offer continuous and educational support to the patient.[1]

In this context, multidisciplinary intervention becomes the strategy of choice, as it allows the patient to be approached in a holistic manner, integrating the knowledge of physicians, nutritionists, physical educators, and other specialists.[2,3] The coordinated action of a

healthcare team is capable of promoting better treatment adherence and more effective management of multiple risk factors.[3] The present study therefore aims to evaluate the impact of a structured multidisciplinary intervention on the clinical and metabolic profile of patients with high cardiovascular risk, supporting the need for integrated and patient-centered care models for the mitigation of cardiometabolic diseases.

CASUISTRY AND METHODS

A pilot cohort study was carried out, conducted in a specialized and multidisciplinary outpatient clinic composed of a cardiologist, endocrinologist, and nutritionist. The protocol was designed to evaluate the impact of a structured intervention on body composition and the metabolic profile of patients over a period of six months.

The casuistry consisted of individuals followed in the aforementioned unit, submitted to a systematized diagnostic approach. The inclusion criteria were based on the need for cardiometabolic follow-up and availability for the proposed follow-up period.

Initial Evaluation Protocol

The diagnostic phase comprised a comprehensive evaluation, divided into three areas:
Laboratory and Cardiovascular Profile: performance of biochemical tests for metabolic evaluation and complementary imaging examinations for risk stratification and cardiovascular function;
Body Composition: patients underwent electrical bioimpedance, aiming at the detailed analysis of fat mass and lean mass;
Multidisciplinary Evaluation: concurrent consultations with the medical and nutrition team for the collection of anthropometric data, history of pre-existing diseases, and dietary pattern.

Intervention and Follow-up

After data collection, a multidisciplinary meeting was held for the consolidation of the cardiometabolic diagnosis. Based on the results, a structured intervention plan was established in four pillars, presented below:
Nutrition: prescription of a diet with mild to moderate caloric restriction associated with protein supplementation;
Physical Exercise: recommendation of resistance training for the preservation of muscle mass;
Pharmacotherapy: use of drug treatment, when indicated, with gradual dose progression;
Monitoring: the patient received a structured feedback report and was followed through a food control application and direct contact with the team.

The in-person follow-up visits for reassessments and therapeutic adjustments were scheduled every 90 days, totaling two follow-up cycles over the six-month period.

Considering the statistical analysis, comparisons between groups were performed by means of one-way analysis of variance (ANOVA), followed by the Scheffé post hoc test for identification of specific differences, when overall statistical significance was observed ($p \leq 0.05$), with data expressed as mean ± standard deviation. The present study was approved by the Leide nas

Figure 2. (A) Patient positioning for pre-oxygenation. (B) Video laryngoscopy.

Neves Ferreira Research Ethics Committee under number CAAE: 92909925.3.0000.5082.

RESULTS

For this study, 27 individuals were selected. The baseline characteristics of the sample are presented in table 1.

Table 1: Baseline Characteristics of the Sample.

	Absolute value and percentage
Female sex	11 (40.7%)
Male sex	16 (59.3%)
SAH	4 (14.8%)
CAD	14 (51.9%)
DM	9 (33.3%)
DLP	24 (88.9%)
Sedentary lifestyle	19 (73.1%)
Hypothyroidism	4 (15.4%)
Previous stroke	2 (7.4%)
OSAHS	8 (29.6%)
	Mean ± SD
Age (years)	54.2 ± 8.2
Weight (Kg)	100.9 ± 15.4
BMI (kg/m^2)	34.9 ± 4.3
WC (cm)	111.7 ± 13.4
Height (metres)	1.70 ± 0.1

SAH: systemic arterial hypertension; CAD: coronary artery disease; DM: diabetes mellitus; DLP: dyslipidemia; stroke: cerebrovascular accident; OSAHS: obstructive sleep apnea-hypopnea syndrome; BMI: body mass index; WC: waist circumference; kg: kilograms; cm: centimeters; SD: standard deviation.
Source: The authors.

The evolution of the anthropometric data during follow-up is described in table 2, below. There was a significant decrease in body mass index (BMI).

Table 2: Anthropometric Data During the Follow-up Period.

	Baseline	3 months	6 months	$p^{\dagger}$
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	
Weight (Kg)	100.9 ± 15.4	96.4 ± 15.3	93.8 ± 15.9	0.11
BMI (Kg/m^2)	34.9 ± 4.3	33.4 ± 4.6	31.1 ± 7.6*	**0.03**
WC (cm)	111.7 ± 13.4	106.8 ± 12.2	105.8 ± 12.5	0.12

BMI: body mass index; WC: waist circumference; kg: kilograms; cm: centimeters; SD: standard deviation. * versus baseline. † one-way analysis of variance (ANOVA), followed by the Scheffé post hoc test (p≤0.05).
Source: The authors.

Considering body composition, by means of the bioimpedance technique, loss of fat mass and maintenance of lean mass were found. No changes were observed in the volume of visceral adiposity. The data are presented in Table 3, below.

Table 3: Anthropometric Data During the Follow-up Period.

	Baseline	3 months	6 months	$p^{\dagger}$
	Mean ± SD	Mean ± SD	Mean ± SD	
Bioimpedance				
VAT (index)	18.0 ± 4.6	17,0 ± 4.6	15,9 ± 4.6	0.11
FM %	39.6 ± 6.7	37,7 ± 6.5	35,8 ± 6.4*	**0.05**
LM %	34.0 ± 4.5	35,0 ± 4.2	36,1 ± 4.0	0.10

VAT: total visceral fat; FM: percentage of fat mass; LM: percentage of muscle mass; SD: standard deviation; %: percentage. * versus baseline. † one-way analysis of variance (ANOVA), followed by the Scheffé post hoc test (p≤0.05).
Source: The authors.

Table 4 shows the values obtained in the laboratory evaluations at three and six months. A decrease in the values of low-density lipoprotein (LDL) and triglycerides (TG) is observed after six months of follow-up. The other variables did not show significant changes.

Table 4: Laboratory Test Evaluation.

	Pré	3 months	6 months	$p^{\dagger}$
	Mean ± SD	Mean ± SD	Mean ± SD	
LDL	96.3 ± 49.4	60.9 ± 36.9*	65.6 ± 39.9*	**0.03**
TG	199.3 ± 139.0	123,. ± 83.4	111.9 ± 69.7*	**0.01**
HDL	43.5 ± 11.8	41.2 ± 10.9	42.7 ± 11.1	0.82
Blood glucose	112.7 ± 33.7	108.3 ± 28.2	102.3 ± 30.3	0.27
HbA1c	5.9 ± 1.0	5.8 ± 0.8	5.5 ± 0.7	0.14
CRP	3.1 ± 3.5	2.3 ± 3.2	3.3 ± 10.0	0.93

: LDL: low-density lipoprotein; TG: triglycerides; HDL: high-density lipoprotein; HbA1c: glycated hemoglobin; CRP: C-reactive protein. * versus baseline. † one-way analysis of variance (ANOVA), followed by the Scheffé post hoc test (p≤0.05).
Source: The authors.

Considering drug treatment, statins were used in 77.8% of the individuals and GLP-1 agonists in 40.7% of the sample.

DISCUSSION

The results of this pilot study demonstrate that a structured care intervention focused on cardiometabolism has a significant clinical impact on the reduction of anthropometric

and lipid parameters in a population at high cardiovascular risk. The observed reduction in body mass index (BMI), LDL cholesterol, and triglycerides (TG), accompanied by the preservation of lean mass, reinforces the effectiveness of multidisciplinary approaches in the management of cardiometabolic risk.

The prevalence of cardiometabolic diseases, such as arterial hypertension and diabetes mellitus, has shown a trend of continuous growth, which requires increasingly earlier and more effective intervention strategies.[1,2] In the present study, the use of statins in 77.8% of the sample and GLP-1 receptor agonists in 40.7% reflects alignment with contemporary guidelines, which recommend strict LDL control in the prevention of atherosclerotic events.[4,5] However, real-world data indicate that, even with treatment, a considerable proportion of high-risk patients do not achieve the recommended lipid targets, highlighting the need for more intensive follow-up programs.[4,5]

The effectiveness of GLP-1 analogues in weight reduction and improvement of the metabolic profile is widely recognized, but the therapeutic response is marked by notable interindividual variability.[6,7] Factors such as sex and baseline glycemic index may influence the results. Women tend to show a greater weight-loss response than men with the use of semaglutide and liraglutide.[3,6] Despite this, the phenomenon of the non-responder patient, in which patients do not achieve the expected 5% weight loss, is a clinical reality.[6,7] Some therapeutic failures may be linked to complex biological factors, including GLP-1R receptor genetics and metabolic adaptation.[6] In addition, the management of these patients should consider that an inadequate response to a GLP-1 analogue may require adjustment to higher doses or switching to more potent co-agonists, such as tirzepatide.[7]

A result that deserves discussion is based on the maintenance of lean mass observed in this intervention, during the weight-loss process, which stands out as a positive differential. In scenarios of accelerated weight loss, common in the GLP-1 era, functional sarcopenia becomes a growing concern, which validates the importance of programs that combine pharmacotherapy with lifestyle interventions focused on global metabolic health.[7]

This study has an important limitation that needs to be highlighted. Only 27 individuals were followed, preventing us from verifying whether the proposed intervention could achieve higher levels of effectiveness in the control of the studied risk factors. Our research group is developing a study with a larger number of patients, seeking to overcome this bias.

CONCLUSION

Preliminary data show that a care program focused on cardiometabolism has a high potential to alter risk-associated parameters. A longer follow-up period is necessary to determine definitive adherence and event reduction.

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MAILING ADDRESS

GIULLIANO GARDENGHI
Hospital Encore – Rua Gurupi, Quadra 25, Lote 6 a 8 – Vila Brasília,
CEP: 74905-350 – Aparecida de Goiânia/GO, Brazil.
E-mail: cE-mail: giulliano.gardenghi@encore.com.br

EDITORIAL AND REVIEW

Received: 03/02/26. Accepted: 19/03/26. Published in: 02/04/2026.