Association between lifestyle and hypertriglyceridemic waist phenotype in the PREDIMED-Plus study

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Disclosure: The authors declare no conflict of interest

PREDIMED-Plus study is registered with ISRCT registry. http://www.isrctn.com/ISRCTN89898870

Word count main text: 3.085

Tables: 5

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Abstract

Objective: Hypertriglyceridemic waist (HTGW) phenotype is characterized by abdominal obesity and high levels of triglycerides (TGs). We evaluated HTGW phenotype prevalence, analyzed associated risk factors, and examined the lifestyle of individuals with metabolic syndrome and HTGW in a cross-sectional assessment of PREDIMED-Plus trial subjects at baseline**.**

Methods: 6874 subjects aged 55-75 with body mass index (BMI) ≥27 and <40 kg/m^2 were included and classified by presence (HTGW+) or absence (HTGW-) of HTGW (waist circumference: men≥102 cm, women≥88 cm; fasting plasma TGs≥150 mg/dL). Analytical parameters and lifestyle (energy intake and expenditure) were analyzed.

Results: 38.2% were HTGW+. HTGW+ subjects tended to be younger, have a greater degree of obesity, sedentary, and tobacco users. They had higher peripheral glucose, total, and LDL cholesterol levels; lower HDL cholesterol levels; and increased prevalence of type 2 diabetes mellitus (T2DM). Mediterranean diet (MedDiet) adherence and physical activity (PA) were greater in HTGW- patients. Age, BMI, tobacco use, total energy expenditure, hypertension, T2DM, and MedDiet adherence were associated with HTGW+.

Conclusion: HTGW is a highly prevalent phenotype in our population associated with younger age, higher BMI, tobacco use, and decreased MedDiet adherence. HTGW- subjects were more physically active with greater total PA and fewer had hypertension.

Keywords: Clinical Trials; Abdominal obesity; Hypertriglyceridemia; Life Styles.

What is already known about this subject?

- Hypertriglyceridemic waist (HTGW) is an alternative concept to metabolic syndrome.
- HTGW is a phenotype of cardiometabolic risk prevalent in the adult population
- HTGW may be an alternative to the metabolic syndrome to detect the population at risk for Type 2 Diabetes Mellitus (T2DM) and cardiovascular disease (CVD), especially in young people who have no criteria for the metabolic syndrome.

What does this study add?

- This study evaluates the relationship between metabolic risk factors and HTGW phenotype in elderly at high cardiovascular risk.
- Our results showed that the prevalence of HTGW+ phenotype is high and is closely associated with a sedentary lifestyle, an important risk factor in the development of obesity-related metabolic pathologies.

How might your results change the direction of research or the focus of clinical practice?

The diagnostic of HTGW in habitual clinical practice by the measure of perimeter abdominal and clinical analytical of TGs levels can help to the clinicians take clinical decisions than prevent metabolic syndrome.

Introduction

Hypertriglyceridemic waist (HTGW) is an alternative concept to metabolic syndrome (MetS) as a simple and reliable indicator of cardiovascular and metabolic risk in subjects with visceral obesity [1]. The HTGW phenotype is characterized by the simultaneous presence of increased waist circumference (WC) and high levels of triglycerides (TGs); it is a better predictor of cardiovascular risk than each component separately [2,3].

Few studies have analyzed the presence of the HTGW phenotype in the adult population and cut-off points for defining it have yet to be determined [4]. The HTGW phenotype has been used to identify individuals who are susceptible to being at greater risk of cardiometabolic disorders such as high body mass index (BMI), elevated C-reactive protein (CRP), increased total cholesterol, decreased high-density lipoproteins (HDLc), and elevated low-density lipoproteins (LDLc) [5].

Obesity and unhealthy lifestyles (physical inactivity and a high calorie diet) are modifiable factors related to the development and worsening of HTGW [6]. The Mediterranean diet (MedDiet), characterized by the abundant consumption of olive oil, fruit, vegetables, legumes, whole-grain cereals, and nuts; moderate intake of red wine with meals, fish, seafood, fermented dairy products, poultry, and eggs; and low consumption of red and processed meats, dairy, and sweets [7] is a protective factor against cardiovascular disease (CVD), obesity, dyslipidemia, and type 2 diabetes mellitus (T2DM) [8]; reduces WC [9]; and decreases the incidence of major cardiovascular events [10-12]. Furthermore, programmed aerobic physical activity (PA), done regularly over time and individualized in type and intensity, also offers cardiometabolic benefits [13,14]

However, despite the marked association between metabolic risk factors and HTGW phenotype, few studies have evaluated this relationship in elderly at high cardiovascular risk. Thus, this study aimed to carry out a cross-sectional analysis to examine the presence of HTGW phenotype in our cohort at baseline conditions and prior to randomization. We analyze risk factors associated with this phenotype, and evaluate the lifestyle of the individuals with the HTGW phenotype in the PREDIMED-Plus Study.

Subjects and Methods

This study is a cross-sectional analysis of baseline data from the PREDIMED-Plus study. The PREDIMED-Plus study is a 6-year multicenter, randomized, parallel-group, primary cardiovascular prevention clinical trial conducted in Spain. Participants

were randomized to receive either MedDiet and general recommendations on diet and exercise or more in-depth advice on MedDiet and support from a nutritionist along with PA. MedDiet started when subjects signed the informed consent form. A more detailed description of the PREDIMED-Plus study is available at http://PREDIMEDplus.com/ [**15**]. This study is registered with the International Standard Randomised Controlled Trial (ISRCT) registry. http://www.isrctn.com/ ISRCTN89898870. Registration date: 24 July 2014.

Patients were recruited and randomized in 23 centers in Spanish universities, hospitals, and research institutes from October 2013 to December 2016. Inclusion criteria were males aged 55-75 years and women aged 60-75 years with overweight/obesity (BMI ≥27 and <40 kg/m^2) who met at least three MetS criteria, defined according to the updated harmonized criteria of the International Diabetes Federation, the American Heart Association, and the National Heart, Lung and Blood Institute [**16**]. All patients provided written informed consent. The study protocol and procedures were approved according to the ethical standards of the Declaration of Helsinki in all the participating centers by institutional ethical committees.

Exclusion criteria included previous CVD (acute myocardial infarction or stroke); cancer or a history of cancer in the last 5 years (with the exception of non-melanoma skin cancer); inability to follow the recommended diet or inability to perform PA; low probability of changing eating habits; inability to come to the scheduled visits for the intervention; being immobile, pregnant, or hospitalized at the time of the study; and having a severe psychiatric disorder, alcohol use disorder, or drug addiction.

In this study, the population was classified according to presence or absence of HTGW (HTGW+/HTGW-), diagnosed using anthropometric criteria for the European population and biochemical parameter level. These criteria include a WC for men ≥102 cm and for women ≥88 cm [**17**] as well as fasting plasma TGs ≥1.71 mmol/L (≥150 mg/dL) [**18,19**]. Measurements of weight, height, BMI, WC (at the mid-point between the anterosuperior iliac crest and the last costal arch, parallel to the ground and upon exhalation), and blood pressure (mean of three measurements after a 5-minute rest) were carried out following the PREDIMED-Plus operations protocol by previously trained healthcare workers (doctors or nurses) in duplicate.

Blood analyses were performed after a 12-hour fast. Samples were analyzed in the laboratory of the reference hospital and biochemical measurements were obtained using routine methods. Samples from patients were immediately processed after their reception and frozen following current procedures. They were then handled by the PREDIMED-Plus common biobank of samples following standardized work protocols.

All patients underwent a lifestyle modification consisting of a nutritional intervention (MedDiet) and PA. For the nutritional assessment, all patients filled in a validated semi-quantitative 137-item food frequency questionnaire to assess dietary habits [20,21] as well as a validated 17-item questionnaire [22] to measure the degree of adherence to the MedDiet. High adherence was considered to be a result of 12–17 points, moderate adherence a result of 8–11 points, low adherence a result of 5–7 points, and very low adherence a result of <5 points. Finally, PA (duration and intensity) was measured using a self-reported and validated Regicor Short Physical Activity Questionnaire (RSPAQ) [23-24]. The validation study of the RSPAQ revealed high reliability (intraclass correlation coefficient for total-PA = 0.82) and reasonable validity (Spearman correlation coefficient for total-PA= 0.39). Sedentarism was evaluated using the Rapid Assessment of Physical Activity (RAPA) questionnaire, a 7-item questionnaire where sedentarism was defined as a score of 1-3 points [25].

Statistical analysis

The database used for this study was the complete PREDIMED-Plus database available as of June 13th, 2017 (internal code: 201706131354_PREDIMEDplus_2017-06-13). Quantitative variables are expressed as means and standard deviations (SD) and qualitative variables as a percentage. Student's t-test was used to compare quantitative variables and the Chi-square test and Mantel-Haenszel test for qualitative variables. In order to determine factors that were independently associated with the prevalence of HTGW, multivariate logistic regression techniques were applied using HTGW as a dependent variable and controlling for confounding variables such as age, BMI, tobacco use, sedentarism, education level, PA, adherence to MedDiet, and presence of comorbidities (T2DM or hypertension). Finally, bivariate correlations were determined using the Pearson correlation coefficient analysis.

We used the baseline study database generated in August 2017. All analyses were done with SPSS, version 22.0.

Results

Of the initial 6874 subjects included in the PREDIMED-Plus trial, 142 (2.1%) did not meet the inclusion criteria for the present study. Therefore, 6732 patients were included in this study (3488 (51.8%) men and 3244 (48.2%) women). Mean age was 65.0±4.9 years old, mean BMI was 32.7±3.4 kg/m^2, and mean WC was 108.1±9.7 cm. The population was classified according to presence or absence of HTGW. A total of

2574 subjects (38.2%) met HTGW criteria. **Table 1** shows the clinical and biochemical differences between HTGW+ and HTGW- subjects.

The HTGW+ group was younger (p<0.0001); with more obesity (p<0.0001); had a higher prevalence of a sedentary lifestyle (p<0.0001); a higher prevalence of smoking habits (p=0.001); and higher glucose (p<0.0001), hemoglobin A1c (HbA1c) (p<0.0001), creatinine (p<0.0001), and lipid profile levels (total cholesterol, LDLc, and TGs) combined with lower HDLc levels (p<0.0001 for all) than HTGW- subjects. In addition, prevalence of T2DM was significantly higher in the HTGW+ population (28.5% vs 26.0; p<0.0001; OR 1.13 [1.01-1.26]).

Energy consumption, food intake, and adherence to MedDiet are summarized in **Table 2**. Although no significant differences were found in energy consumption and food intake between both groups, the MedDiet questionnaire revealed that HTGW- participants had greater adherence to MedDiet in comparison with HTGW+ participants (p<0.0001).

Energy expenditure was associated with HTGW. As shown in **Table 3**, HTGW+ subjects did slightly more light exercise than HTGW- subjects, though this finding was not statistically significant. However, HTGW+ subjects did significantly less moderate and vigorous PA (-200 Met.min/week (w), respectively) and total PA (-300 Met.min/w) than HTGW- patients.

Table 4 shows the linear correlations between levels of TGs and WC with various baseline characteristics, adherence to MedDiet, and PA in HTGW+ and HTGW- subjects. In the HTGW+ group, levels of TGs were significantly negatively correlated with age, HDLc levels, and performing vigorous PA. They were positively correlated with tobacco use; presence of T2DM; and glucose, creatinine, very low-density lipoproteins (VLDLc), and HbA1c levels. WC was negatively correlated with age; education level; total cholesterol, LDLc, and HDLc levels; MedDiet adherence and performing vigorous PA. Moreover, WC was positively correlated with BMI; tobacco use; presence of CVD and T2DM; glucose, creatinine, HbA1c, and VLDLc levels; sedentarism; and total PA. In the HTGW- group, levels of TGs were significantly negatively correlated with age, BMI, presence of CVD, education level, HDLc levels, and MedDiet adherence. They were positively correlated with tobacco use and creatinine, LDLc, and VLDLc levels. On the other hand, WC was negatively correlated with age; education level; total cholesterol, LDLc, VLDLc, and HDL levels; MedDiet adherence; performing vigorous PA; and total PA. Moreover, WC was positively correlated with BMI; tobacco use; presence of CVD and T2DM; glucose, HbA1c, and creatinine levels; and sedentarism.

According to the adjusted logistic regression model (OR), age (OR 0.98 [0.97-0.99]), adherence to MedDiet (OR 0.96 [0.95-0.98]), total energy expenditure (OR 0.995

[0.994-0.996]), and hypertension in treatment (OR 0.84 [0.73-0.96]) protected against presence of the HTGW phenotype (**Table 5**).

Discussion

Our results indicate that in the PREDIMED-Plus study, almost 40% of the population had HTGW. Patients with HTGW were slightly younger—all in their 60s—more physically inactive, had lower adherence to the MedDiet, and had a higher prevalence of tobacco use. We recruited subjects with different age ranges according to whether they were male or female, according to study protocol. It is well known that among individuals without diabetes, absolute rates of CVD are higher in men than in women at all ages except for very old ages, where prevalence of stroke is higher in women than in men [**26**]. Therefore, we included older women in order to create groups with similar risk. These HTGW+ patients also had higher levels of glucose, total cholesterol, LDLc, and TGs and lower levels of HDLc. Furthermore, this population had a higher prevalence of T2DM. These data are in concordance with findings recently published by other authors [**27,28**]. According to previous studies, prevalence of HTGW increases with age, reaching almost 30% in those aged 60–69 years [**1**]. We found an unusual negative association between HTGW+ and age. This fact could be explained to decreased adherence to the MedDiet in younger patients (<65 years). Furthermore, García Álvarez A. et al. suggested a positive association between smoking and central obesity in the Spanish population [**29**].

Obesity is accompanied by multiple hormonal, inflammatory and endothelial abnormalities. These abnormalities induce stimulation of several other mechanisms that contribute to hypertension and increased cardiovascular morbidity [**30**]. In our study, we observed that drug treatment associated with changes in diet and lifestyle protect against the presence of HTGW. This data is in concordance with a statement published in 2012 by the European Association for the Study of Obesity and the European Society of Hypertension [**31**], which highlights recommendations for preventing and treating obesity and complications associated with obesity based on the rationale that weight reduction may have a beneficial effect on overall risk and may contribute to blood pressure control.

The use of WC as a fundamental parameter for defining MetS is becoming more common as WC is correlated with high TGs levels. HTGW is a cardiometabolically risky phenotype that is prevalent in the adult population and is an alternative to MetS for detecting people at risk for T2DM, particularly in young individuals who do not meet MetS criteria [**1**].

HTGW+ prevalence was elevated in our population. Factors such as age, BMI, tobacco use, adherence to MedDiet, and total energy expenditure were associated with the presence of HTGW, according with Fagundes et al. [32]. In this study, the population aged ≥60 years had a high prevalence of HTGW, with physical inactivity and overweight as key factors associated with this phenotype.

Lifestyle (a healthy diet and PA) is very important in preventing the causes of morbidity and mortality associated with MetS. In regards to diet, some authors have recently demonstrated that MetS [33] and T2DM [34] could be prevented by eating a healthy diet, such as the MedDiet. In our population, no significant differences were found between the different components of MedDiet and the presence/absence of HTGW. These data are in concordance with the findings of Andrade et al. [35]. The HTGW+ population consumed more total fat (+8 g/d) and cholesterol (+6 g/d), thus indicating decreased adherence to the MedDiet prior to randomization. Some strategies to reduce high levels of TGs and HTGW are to reduce excess weight and the total amount of dietary carbohydrates. In addition, it is recommended to increase PA and that saturated fatty acids (SFA) be substituted by monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) [36]. It has been shown that the MedDiet, which is characterized by low SFA (8%) and high MUFA (12%), PUFA (8%), and fiber content, promote a significant reduction in levels of TGs [10,37].

The MedDiet prevents loss of lean mass and improves metabolic parameters in the population with obesity [38]. Therefore, high adherence to the MedDiet could protect against developing HTGW since this diet could led to a greater reduction in TGs levels than others [39].

In regards to PA, a great majority (80.4%) of HTGW+ in our study had obesity. Coinciding with other studies [40], the presence of HTGW and abdominal fat were more prevalent in the sedentary population. Previous studies have shown that presence of HTGW can be associated with sedentarism [41]. Several studies also show that higher intensity (moderate-vigorous) PA reduces abdominal fat accumulation [42] and it was negatively associated with WC [43]. In addition, PA has a beneficial effect on numerous metabolic and cardiovascular risk factors and reduces the risk of T2DM and CVD [44]. This effect is in accordance with our results, which demonstrated that the subjects who performed higher intensity PA (moderate-vigorous) tended not to have HTGW. On the other hand, some studies found no differences between PA intensity and components of abdominal fat distribution, suggesting that health benefits from PA are related to an overall reduction in adipose tissue [42]. A strong association between PA (moderate or vigorous) and visceral and subcutaneous adipose tissue has

been demonstrated, indicating the protective effect of PA against fat deposition in the general population with sedentary lifestyle habits [45].

According to the results of this study, we can affirm that a lifestyle based on MedDiet and regular PA prevents the appearance of HTGW in subjects with MetS. Furthermore, it also reduces the risk of developing diseases associated with obesity such as T2DM or CVD.

Our study has some limitations. This study was carried out in subjects who have MetS or T2DM, are Caucasian, are of advanced age, and who were recruited to follow the established MedDiet guidelines. Therefore, the results cannot be extrapolated to other populations with different pathologies, who are of different races or ages, or who have another type of energy intake. In addition, despite the fact we found some significant results in the correlation analyses, most of the analyses yielded weak or moderate results. On the other hand, strength of our study is the large sample of participants of both sexes. This lends robustness to the results obtained and as such, the public health message encouraging healthy lifestyle habits for all patients with obesity should continue to be emphasized as it has been demonstrated that MedDiet could be useful in preventing greater cardiovascular risk.

In conclusion, the data obtained from a sample of the Spanish adult population indicate that the prevalence of HTGW+ phenotype is high—almost 40%—and is closely associated with a sedentary lifestyle, which is an important risk factor in the development of obesity-related metabolic pathologies.

Acknowledgements

We thank all PREDIMED-Plus participants and investigators. CIBEROBN, CIBERESP, and CIBERDEM are initiatives of the Instituto de Salud Carlos III (ISCIII), Madrid, Spain. The Hojiblanca (Lucena, Spain) and Patrimonio Comunal Olivarero (Madrid, Spain) food companies donated extra-virgin olive oil. The Almond Board of California (Modesto, CA), American Pistachio Growers (Fresno, CA), and Paramount Farms (Wonderful Company, LLC, Los Angeles, CA) donated nuts. The authors also thank the PREDIMED-Plus Biobank Network, part of the ISCIII National Biobank Platform, for storing and managing the PREDIMED-Plus biological samples. Thanks to Malaga Hospital-IBIMA Biobank, member of the Andalusian Public Health System Biobank, part of the National Biobank Platform (project PT13/0010/0006). Thanks to Claire Alexandra Conrad for her help with the final English-language version.

Funding. The PREDIMED-Plus trial was supported by grants from the Instituto de Salud Carlos III, cofinanced by the Fondo Europeo de Desarrollo Regional-FEDER

including the following projects: PI13/00673, PI13/00492, PI13/00272, PI13/01123, PI13/00462, PI13/00233, PI13/02184, PI13/00728, PI13/01090, PI13/01056, PI14/01722, PI14/00636, PI14/00618, PI14/00696, PI14/01206, PI14/01919, PI14/00853, PI14/01374, PI16/00473, PI16/00662, PI16/01873, PI16/01094, PI16/00501, PI16/00533, PI16/00381, PI16/00366, PI16/01522, PI16/01120, PI17/00764, PI17/01183, PI17/00855, PI17/01347, PI17/00525, PI17/01827, PI17/00532, PI17/00215, PI17/01441, PI17/00508, PI17/01732, and PI17/00926; the Cohorte PREDIMED-PLUS grant; the European Research Council (Advanced Research Grant 2014–2019, 340918 granted to MAM-G); the Recercaixa grant (2013ACUP00194); grants from Consejeria de Salud de la Junta de Andalucia (PI0458/2013, PS0358/2016, PI0092/2017, PI0096/2017 and PI0137/2018); a grant from the Generalitat Valenciana (PROMETEO/2017/017); a SEMERGEN grant, and funds from the European Regional Development Fund (CB06/03). M Rosa Bernal-Lopez was supported by “Miguel Servet Type I” program (CP15/00028) from the ISCIII-Madrid (Spain), cofinanced by the Fondo Europeo de Desarrollo Regional-FEDER. JCF-G was supported by a research contract from the Servicio Andaluz de Salud (SAS) (B-0003-2017). A.M-G. and O.C. are the recipient of a postdoctoral grant (Juan Rodes JR 17/00023 and JR 17/00022, respectively) from the Spanish Ministry of Economy and Competitiveness. None of the funding sources took part in the design, collection, analysis, or interpretation of the data or in the decision to submit the manuscript for publication.

Data Sharing Statement. The dataset (including data dictionaries) of PREDIMED-Plus is available to external investigators in order to make possible the replication of the main analyses used for the published article. However, due to the restrictions imposed by the Informed Consent and the Institutional Review Boards (IRB), bona fide investigators interested in analyzing the PREDIMED-Plus dataset may submit a brief proposal and statistical analysis plan to both corresponding authors. Upon approval from the Steering Committee and IRBs, the data will be made available to them using an onsite secure access data enclave.

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Table 1. Clinical and biochemical differences between individuals with and without hypertriglyceridemic waist (HTGW)

	HTGW +	HTGW -	p
N (%)	2574 (38.2)	4158 (61.8)	<0.0001
Age (years)	64.6 ± 4.9	65.1 ± 4.9	<0.0001
Sex (Male / Female) (n (%))	1335 (38.3) / 1239 (38.2)	2153 (61.7) / 2005 (61.8)	<0.0001/<0.0001
Waist circumference (cm)	109.5 ± 9.3	107.2 ± 9.8	<0.0001
BMI (kg/m^2)	33.1 ± 3.4	32.5 ± 3.5	<0.0001
Overweight (n (%))	504 (19.6)	1167 (28.1)	<0.0001
Obesity (n (%))	2070 (80.4)	2991 (71.9)	<0.0001
SBP (mmHg)	137 ± 18	136 ± 20	0.31
DBP (mmHg)	84 ± 9	84 ± 10	0.01
Low education level (%)	1221 (47.4)	1997 (48.0)	<0.0001
Sedentary lifestyle (%)	16.5	15.0	<0.0001
Smoking (%)	376 (14.6)	471 (11.3)	0.001
Glucose (mg/dL)	117.2 ± 34.2	111.0 ± 25.4	p<0.0001
HbA1c (%)	6.2 ± 1.0	6.0 ± 0.8	p<0.0001
Creatinine (mg/dL)	0.9 ± 0.2	0.8 ± 0.2	p<0.0001
Uric acid (mg/dL)	5.9 ± 1.4	6.1 ± 1.5	p<0.0001
Total cholesterol (mg/dL)	205.8 ± 28.9	191.8 ± 35.9	p<0.0001
LDLc (mg/dL)	121.8 ± 35.5	119.8 ± 31.3	p<0.0001
HDLc (mg/dL)	44.5 ± 10.3	50.2 ± 12.2	p<0.0001
Triglycerides (mg/dL)	191.0 [167.0-236.0]	110.0 [89.0-131.0]	p<0.0001
Lipid-lowering treatment (%)	51.6	49.4	p<0.0001
Hypertension (%)	81.6	84.1	p<0.0001
T2DM (%)	28.5	26.0	p<0.0001

BMI: Body mass index. SBP: Systolic blood pressure. DBP: Diastolic blood pressure. Hba1c: Hemoglobin A1c. LDLc: Low-density lipoprotein cholesterol. HDLc: High-density lipoprotein cholesterol. T2DM: Type 2 diabetes mellitus

Table 2. Energy consumption, food intake, and adherence to the MedDiet in individuals with and without hypertriglyceridemic waist (HTGW).

	HTGW +	HTGW -	P
N (%) Food Frequency Questionnaire	2534 (38.2)	4108 (61.8)	<0.0001
Energy (kcal)	2415.1±636.5	2403.2±623.4	0.45
Total carbohydrates (g/d)	245.9±80.4	249.3±82.0	0.98
Total protein (g/d)	98.0±23.9	97.7±23.8	0.64
Total fat (g/d)	105.6±31.6	97.7±23.8	0.68
SFA (g/d)	26.7±9.7	26.6±9.6	0.60
MUFA (g/d)	54.6±17.5	54.3±17.2	0.40
PUFA (g/d)	17.1±6.8	17.0±6.9	0.66
Cholesterol (mg/d)	385.7±129.1	379.8±120.6	0.06
Fiber (g/d)	26.4±9.2	26.0±9.1	0.08
Phytosterols (mg/d)	398.1±111.2	397.7±111.4	0.88
Alcohol (g/d)	11.1±14.8	11.4±16.3	0.37
N (%) Adherence to MedDiet	2574 (38.2)	4158 (61.8)	<0.0001
Adherence to MedDiet (points)	8.3± 2.7	8.6±2.7	<0.0001

SFA: Saturated fatty acids. MUFA: Monounsaturated fatty acids. PUFA: Polyunsaturated fatty acids. MedDiet: Mediterranean diet.

Given that 90 participants (40 subjects with HTGW+ and 50 subjects with HTGW-) did not have data from the food frequency questionnaire but did have data on adherence to the MedDiet, we have calculated two different variables identified as N (%).

Table 3. Energy expenditure measured using Minnesota questionnaire between individuals with and without hypertriglyceridemic waist (HTGW).

	HTGW +	HTGW -	p
N (%)	2574 (38.2)	4158 (61.8)	<0.0001
Light (Met.min/w)	1074.3±988.7	1069.3±971.5	0.86
Moderate (Met.min/w)	1576.4±1570.2	1741.2±1772.0	0.004
Vigorous (Met.min/ w)	1048.7±1547.4	1212.1±1806.4	0.002
Total (Met.min/w)	2421.9±2188.3	2730.2±2479.6	<0.0001

Table 4. Simple linear correlations between levels of TGs and WC and different basal characteristics, adherence to MedDiet, and PA for HTGW+ and HTGW- subjects. p-values were determined using Pearson's correlation coefficient.

	HTGW+				HTGW-			
	TGs		WC		TGs		WC	
	r	p	r	p	r	p	r	p
Age	-0.116	<0.0001	-0.147	<0.0001	-0.090	<0.0001	-0.074	<0.0001
BMI	0.003	0.86	0.666	<0.0001	-0.096	<0.0001	0.665	<0.0001
Tobacco use (yes vs. no)	0.074	<0.0001	0.067	0.001	0.049	0.002	0.032	0.04
Presence of CVD	0.003	0.87	0.078	<0.0001	-0.053	0.001	0.041	0.008
Presence of T2DM	0.049	0.01	0.087	<0.0001	-0.009	0.59	0.076	<0.0001
Educational Level	-0.033	0.10	-0.095	<0.0001	-0.033	0.04	-0.040	0.01
Glucose	0.092	<0.0001	0.132	<0.0001	-0.015	0.35	0.150	<0.0001
HbA1c	0.077	<0.0001	0.110	<0.0001	-0.017	0.31	0.114	<0.0001
Creatinine	0.134	<0.0001	0.262	<0.0001	0.106	<0.0001	0.134	<0.0001
Total cholesterol	-0.001	0.94	-0.148	<0.0001	0.018	0.27	-0.168	<0.0001
LDLc	0.034	0.10	-0.045	0.028	0.035	0.03	-0.051	0.001
VLDLc	0.379	<0.0001	0.080	<0.0001	0.455	<0.0001	-0.096	<0.0001
HDLc	-0.208	<0.0001	-0.191	<0.0001	-0.200	<0.0001	-0.174	<0.0001
Adherence to MedDiet	-0.026	0.20	-0.136	<0.0001	-0.060	<0.0001	-0.098	<0.0001
Sedentarism	0.036	0.08	0.062	0.002	0.007	0.70	0.093	<0.0001
Moderate PA	-0.012	0.56	-0.010	0.61	-0.005	0.75	-0.017	0.26
Vigorous PA	-0.046	0.02	-0.071	<0.0001	-0.005	0.77	-0.043	0.005
Total PA	-0.036	0.07	0.047	0.02	-0.008	0.64	-0.038	0.01

TGs: Triglycerides levels. WC: Waist circumference. BMI: Body mass index. CVD: Cardiovascular disease. T2DM: Type 2 diabetes mellitus. Hba1c: Hemoglobin A1c. LDLc: Low-density lipoprotein cholesterol. VLDLc: Very low-density cholesterol. HDLc: High-density lipoprotein cholesterol. MedDiet: Mediterranean diet. PA: Physical activity.

Table 5. Factors associated with the presence of hypertriglyceridemic waist. (HTGW+ vs HTGW-). Multivariate analysis.

	OR (95% CI)	p
Sex (Female vs. Male)	1.05 (0.94-1.17)	0.36
Age (y)	0.98 (0.97-0.99)	0.002
BMI (kg/m^2)	1.05 (1.03-1.07)	<0.0001
Smoking (yes vs. no)	1.29 (1.11-1.50)	0.01
Low education level (yes vs. no)	0.99 (0.89-1.10)	0.85
Adherence to MedDiet (p17)	0.96 (0.95-0.98)	<0.0001
Sedentarism (yes vs. no)	0.97 (0.85-1.12)	0.73
Total energy expenditure (Met.min/d)	0.995 (0.994-0.996)	0.002
Hypertension (yes vs. no)	0.84 (0.73-0.96)	0.01
T2DM (yes vs. no)	1.13 (1.01-1.26)	0.03

BMI: Body mass index. MedDiet: Mediterranean diet. T2DM: Type 2 diabetes mellitus.