Prevalence And Factors Associated With Hypertriglyceridemic Waist In Colombian Elderly.

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Abstract

Background: The purpose of this study to analyze the prevalence of hypertriglyceridemic waist and associated factors in older individuals aged ≥ 60 years in Colombia. **Methods:** The data for this study came from a secondary cross-sectional, nationally representative SABE study Survey on Health, Well-Being, and Aging in Colombia, 2015. A total of 3824 participants (59.7% male, 69 (IR=64-76) years) from 86 Colombian municipalities participated. The data were collected through a questionnaire, blood tests, blood pressure measurements and anthropometric measurements. The hypertriglyceridemic waist phenotype was diagnosed using high triglyceride values (≥ 150 mg / dl) and increased waist circumference ≥ 88 and ≥ 102 cm for women and men, respectively. A logistic regression analysis was used to compare the hypertriglyceridemic waist phenotype and the associated factors, significance level of 5%. STROBE checklist for cross-sectional studies was applied in this paper (see Supplementary File 1). **Results:** The hypertriglyceridemic waist was present in 38.7% of the study population, with a higher prevalence among females than males (44.6% vs. 30.0%). Female gender [odds ratio (OR) 1.9 (95% confidence interval (CI) 1.6-2.2)]; be octogenarian [OR 0.7 (95% CI 0.6-0.9)]; live in an urban area [OR 1.5 (95% CI 1.3-1.8)] and have a lifestyle of former smoker [OR 0.8 (95% CI 0.7-0.9)]. On the other hand, it was observed that having a BMI different from normal is strongly associated with HTGW [Weight: OR 2.0 (95% CI 1.5-2.6), overweight: OR 4.1 (95% CI 3.4 -4.9) and obesity: OR 5.0 (95% CI 4.1-6.1)]. The glycemia, the hemoglobin and the increase in cholesterol also showed positive association with HTGW [OR 0.5 (95% CI 0.5-0.7), OR 2.1 (95% CI 1.8-2.4) and OR 2.1 (95% CI 1.9-2.5), respectively] were associated with increased odds of HTGW. **Conclusions:** There is a significant prevalence of hypertriglyceridemic waist in Colombia's elderly and sociodemographic factors, lifestyles and biological markers are associated with the hypertriglyceridemic waist phenotype. Elderly men showed greater probabilities in terms of age, schooling, geographic area, body mass index and cholesterol concentrations. Elderly women revealed higher probabilities in biological markers

Background

According to the WHO, cardiovascular diseases (CVD) are the leading cause of death worldwide and more than three quarters of CVD deaths occur in low and middle income countries (1,2), in part because the aging of the population, the decrease in physical activity and the nutritional transition (3). In order to reduce the avoidable burden of non-communicable diseases (NCDs), member states created the "Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020", which aims to reduce by 2025 the number of premature deaths associated with NCDs by 25%; Among its global goals, some focus directly on the prevention and control of CVD (1).

There are epidemiologically positive associations of the hypertriglyceridemic waist phenotype (HTGW) with the probability of cardiovascular events (4) and type 2 diabetes (5,6). The increase in waist circumference and high levels of triglycerides are not only the main characteristics of the HTGW phenotype, but they are also outstanding predictors in individuals with cardiovascular risk (7) since they behave as a positive marker of visceral obesity (8) The diagnosis of hypertriglyceridemia becomes more

effective when fasting serum levels of triglycerides are obtained, since in this way partial discrimination between subcutaneous and visceral adiposity is achieved (9). In addition to being a predictor of cardiovascular risk in visceral obesity, the HTGW phenotype has been postulated as a first risk marker in the development of metabolic syndrome (MS), and is corroborated by high levels of insulin, apolipoprotein B and cholesterol lipoproteins. (LDL-C) low density, this because of alterations in levels of visceral adipose tissue (8).

The prevalence of the HTGW phenotype is increasing substantially over time and has become a major public health problem worldwide due to its high prevalence, the concomitant risk of metabolic diseases such as type 2 diabetes (T2DM) (10,11).) and its association with coronary heart disease. Although studies on hypertriglyceridemia have been carried out in Colombia, with prevalences between 32.16% (12) and 41.8% (13) in various age groups, the prevalence of the HTGW phenotype in the older adults population and its possible associated factors is unknown, an especially important fact the growth of this population in the last decades. That is why the present study aims to determine the prevalence and factors associated with hypertriglyceridemic waist in Colombian older adults.

Methods

Population

It is a secondary analysis, descriptive and cross-sectional of the information obtained in the Survey on Health, Well-Being, and Aging in Colombia (SABE) 2015, which was financed by the Ministry of Health and Social Protection of Colombia (Minsalud), and the Administrative Department of Science, Technology and Innovation, (Colciencias) and carried out during the years 2014 to 2015 in 3824 elders aged between 60 and 101 years. This survey is a cross-sectional measurement, carried out to explore and evaluate interdisciplinarily and in depth, several aspects that intervene in the phenomenon of aging and old age of the Colombian population(14).

Sampling

The sample for the SABE (2015) was of regional representativeness, self-representation of large cities, with urban-rural stratification of the sample and selection by stages in accordance with the existing municipal cartography in Minsalud, in the following order: Municipalities, urban segments or rural, dwellings or sidewalks, homes and people. The study included the Colombian population aged 60 and over, and the indicators are disaggregated by age ranges, sex, ethnicity and socioeconomic level. This cross-sectional survey was carried out to find out about the current situation, in rural and urban areas, of the population of older adults in Colombia, through interdisciplinary exploration and evaluation and at the depth of old age and aging, in the framework of the Determinants of Active Aging and from the model of the Social Determinants of Health. Details of the survey have been published elsewhere(15).

The universe of study was constituted by 99% of the population residing in private homes in the urban and rural areas. A total of 23,694 surveys were carried out at the national level with a non-response rate

of 34%, 6,365 total population segments for the sample investigation; in 246 municipalities. Bogotá, being the capital, was independently selected with a total of 545 urban segments and a rural segment. The average number of adults found per segment was 4.2(14).

The estimation of means or proportions was made with a level of precision of up to 6% of the maximum expected error, at a level of national disaggregation only. The selection of the participants was by systematic selection and according to the sampling fraction with respect to the general SABE sample (14).

Collection of information and measurement processes

The SABE Colombia Survey was applied in the households of the country selected in the sample and with the presence of older adults. The basic procedure for the application of the population survey was the face-to-face interviewer-older adults adult interview, using a structured questionnaire. The interviewers visited the selected homes door to door, carrying distinctive elements and identifiers of the study. The standardized process of the survey in each visited home involved the identification of the participants, the registration of the demographic data, the signing of the informed consent, the application of the established filters and the selection criteria, the signing of assent when necessary and the completion of questionnaire questions by the interviewer(14).

Blood pressure was taken with an electronic manometer (HEM 7113, Omron Healthcare Co., Ltd., Kyoto, Japan) that met the calibration requirements. The values were recorded after 5 minutes of rest in the sitting position and three consecutive measurements were obtained, waiting at least 30 seconds between the readings(15).

The anthropometric data of height and weight of this study use the methodology of a previously published work and are in accordance with the population surveys approved by Minsalud.(15); the circumference of the waist was measured at the midpoint between the inferior border of the ribs and the iliac crest in the midaxillary plane by a tape Inelastic anthropometric(15).

Analysis of glycemia, total cholesterol and triglycerides: After an overnight fast, blood samples were collected in the morning. The blood samples were centrifuged for 10 minutes at 3000 rpm, 30 min after sample collection. All samples were delivered to a single central laboratory (Dinamica Laboratories, Bogotá, Colombia) for analysis within 24 hours. Residual samples were stored at -80°C for future analyzes(15).

All the questions that were applied in the questionnaire were made in textual form to each person surveyed without any interpretations or clarifications of any kind by the interviewer. When the respondent did not understand any of the questions, despite the fact that the interviewer repeated it verbatim, no clarification was given and the questions of the following domain were passed on.

Dependent variables

The HTGW phenotype was defined as the outcome variable(16), those people who presented with abdominal obesity (the cut points used were abdominal circumference > 80 cm for women and > 90 cm for men (17)) and hypertriglyceridemia (cut-off point used was triglycerides $\geq$ 150 mg / dl (16)).

Independent variables

Sociodemographic variables: Age: between 60 and 64 years old, between 65 and 69 years old, between 70 and 74 years old, between 75 and 79 years old and 80 and over; sex: men and women; schooling: none, basic primary, basic secondary and secondary, and technical or technological, university or postgraduate; Accompaniment at home: live with others and live alone; the socioeconomic position was determined according to the housing stratum (1 to 6), with level 1 being the one with the highest poverty and level 6 with the highest wealth, this classification is a measure developed by the Colombian National Government, which takes into account physical characteristics of the dwellings and their surroundings, the classification in any of the six strata is an approximation to the hierarchical socioeconomic difference, read poverty to wealth or vice versa(17) area or origin: urban or rural.

Lifestyle: smoking, current smoker and former smoker, never smoked; intake of alcoholic beverages, one day or less a week and two days or more a week.

Health conditions: body mass index (BMI): weight cut off points: BMI <18.50, normal weight BMI 18.50 to 24.99, overweight: BMI $\geq$ 25 and <30 and obesity: BMI $\geq$ 30 (19); and abdominal obesity: cutting points used abdominal perimeter > 80 cm for women and > 90 cm for men(18).

Biological markers in blood: Fasting glucose increase: cut-off points $\geq$ 100mg / dL(19), Total cholesterol increase: cut-off points $\geq$ 200 mg / dL (18,19); High-density lipoprotein cholesterol (HDL-c) reduced: cutoff <40 mg / dL in men and <50 mg / dL in women(19); low-density lipoprotein cholesterol (LDL-c) increased $\geq$ 160 mg / dL(19) increased triglycerides: cut-off point $\geq$ 150 mg / dl (3.10); decrease in the concentration of hemoglobin (Hb): cut-off points <13 g / dl in men and <12 g / dl in women in places at sea level(20).

Statistic analysis

The categorical and / or ordinal variables were expressed as frequencies. Chi square tests (X^2) were applied in the categorical variables, with or without Yates correction. Subsequently, an exploratory analysis was conducted to determine the percentage distribution for each of the associated factors. To estimate the relationship between the hypertriglyceridemic waist phenotype and the independent variables, a logistic regression was used. Simple logistic regressions were performed individually for each independent variables to analyze the association with HTGW. HTGW was included in each simple logistic regression as the dependent variable (reference: to have HTGW). Group reference in the simple logistic regressions were: Male (Sex), 60 – 64 years (Age), Technical or university (Scholarship), Live alone (Accompaniment at home), Level IV or more (Socioeconomic level), Rural (Geographic area), No smoker (Smoke), One day or less a week (Ingestion of alcoholic beverages), Normal weight (18.5-24.9 kg/m²)

(Nutritional Status), < 100 mg/dL (Glycemia), < 200 mg/dL (Total-Cholesterol) $\geq$ 40 mg/dL male or $\geq$ 50 mg/dL female (HDL-Cholesterol) < 160 mg/dl (LDL-Cholesterol), $\geq$ 13 g/dl male or $\geq$ 12 g/dl female (Hemoglobin)

The analyzes were performed in the Statistical Package for Social Science® software, version 20 (SPSS, Chicago, IL, United States), and a p value <0.05 was considered significant. The STROBE checklist for cross-sectional studies was applied in this paper(21–23) (see Supplementary File 1)

Results

The general characteristics of the participants are presented according to the general sample, sex and age groups in Table 1 and 2. The median age of the study group was 69 years (64-75), higher in men than in women (69 vs 68); Health conditions for the overall sample were BMI of 26.3 (22.9-29.7) and Waist circumference 92.8 cm (85.1-100.5). The biological markers were, Fasting Glycemia 93 mg / dL (86-103), Total-Cholesterol 193 mg / dL (167-221), HDL-Cholesterol 44 mg / dL (36-53), LDL-Cholesterol 125 mg / dL (102-149), Fasting Serum Triglycerides 142 mg / dL (106-194) and Fasting Serum Hemoglobin 13.8 g / dL * (12.8-14.9). Statistical differences were observed in all the medians according to sex in all the mentioned variables, which are observed in table 1.

The majority of participants (men = 2282, women = 1542) were in the age range of 60-64 years (29.4%), primary level of primary school (58.9%), lived with other people (91.6%), socioeconomic level II (42.3%), urban area (82.0%), non-smokers (50.3%) and alcoholic beverages one day or less per week (97.9%) were the most prevalent socio-demographic characteristics. Regarding health conditions, the majority of the sample had abdominal obesity (76.7%) and 36.2% were overweight. The biological markers for the global sample were, glycemia <100 mg / dL (optimum) (68.6%), Total-Cholesterol <200 mg / dL (optimum) (55.9%), HDL-Cholesterol <40 mg / dL male or < 50 mg / dL female (54.2%), LDL-Cholesterol $\geq$ 160 mg / d (83.3%), Triglycerides <150 mg / dL (optimum) (54.7%) and Hemoglobin $\geq$ 13 g / dl male or $\geq$ 12 g / dL female (optimum) (82.1%). Several male vs. female percentage statistical differences were observed in all the variables studied, except in the concentration of serum hemoglobin, which showed that the overall proportions are similar to the proportions in men and women. (Table 2)

The overall prevalence of HTGW was 38.7%. Women had a higher prevalence of HTGW than men 44.6% vs. 30.0%. A high prevalence of HTGW was found in the older adults from 70 to 74 years of age (40.8%), the lowest prevalence was found in the older adults aged 80 and over (32.3%). Regarding the socioeconomic level, it was observed that the older adults of medium-low income or of level II, presented a high prevalence of HTGW (41.3%), as well as those who reside in urban areas (40.4%). Regarding lifestyles, a higher prevalence of HTGW was observed in the older adults who never smoked (41.6%). In the body mass index, the older adults obese, had a higher prevalence of HTGW (53.3%) compared to the

other BMI classifications. The biological markers in blood showed significant differences in the prevalences of HTGW, being higher in the older adults groups with fasting glucose ≥ 100 mg / dL (50.6%), total cholesterol ≥ 200 mg / dL (48.8%), HDL-c <40 mg / dL male or <50 mg / dL female (55.9), LDL-c ≥ 160 mg / dL (53.3%) and serum hemoglobin ≥ 13 g / dL male or ≥ 12 g / dL female (41.1%). (Table 3).

The prevalence of HTGW in men showed significant differences in terms of those between 60 and 64 years old (36.1%), those of technical or university level (36.1%), those with the highest income or level IV or more (35.7%). %, those who are in the urban area (33.1%), those who classify with obese BMI (59.5%), those who have fasting glucose ≥ 100 mg / dL (43.1%). The biological markers showed significant differences regarding the prevalences of HTGW, both in men and women, as can be seen in table 3.

In the binary logistic regression analysis, it was found that HTGW in Colombian older adults people was significantly associated with being female [OR 1.9 (95% CI 1.6-2.2)]; be octogenarian [OR 0.7 (95% CI 0.6-0.9)]; live in an urban area [OR 1.5 (95% CI 1.3-1.8)] and have a lifestyle of former smoker [OR 0.8 (95% CI 0.7-0.9)]. On the other hand, it was observed that having a BMI different from normal is strongly associated with HTGW [Weight: OR 2.0 (95% CI 1.5-2.6), overweight: OR 4.1 (95% CI 3.4 -4.9) and obesity: OR 5.0 (95% CI 4.1-6.1)]. The glycemia, the hemoglobin and the increase in cholesterol also showed positive association with HTGW [OR 0.5 (95% CI 0.5-0.7), OR 2.1 (95% CI 1.8-2.4) and OR 2.1 (95% CI 1.9-2.5), respectively]. There was an inverse association of HTGW versus current smoker [OR 0.6 (95% CI 0.5-0.8)] and former smoker [OR 0.8 (95% CI 0.7-0.9)] (Figure 1).

Likewise, the results of the bivariate analyzes that show specific odds ratios by sex for the relationship between HTGW and the possible risk factors are shown. The factors associated with HTGW in men in the bivariate analyzes were: being between 75 and 79 years old [OR 0.5 (95% CI 0.4-0.8)], None scholarship [OR 0.5 (95% CI 0.3-0.8)], urban Geographic area [OR 2.1 (95% CI 1.6-2.9)], be obese [OR 13.0 (95% CI 8.9-19.1)], Glycemia ≥ 100 mg / dL [OR 2.3 (95% CI 1.8-2.9)], Total-Cholesterol ≥ 200 mg / dL [OR 1.9 (95% CI 1.5-2.4)], HDL-Cholesterol <40 mg / dL male or <50 mg / dL female [OR 5.3 (95% CI (4.2-6.8))], LDL-Cholesterol ≥ 160 mg / dL [OR 1.6 (95% CI (1.2-2 , 2) Among women, the variables associated significantly were: Overweight [OR 2.8 (95% CI (2.2-3.5))], Glycemia ≥ 100 mg / dL [OR 1.9 (95% CI 1, 6-2.3)], Total-Cholesterol ≥ 200 mg / dL [OR 2.1 (95% CI (1.7-2.4))], HDL-Cholesterol <40 mg / dL male or <50 mg / dL female [OR 5.5 (95% CI (4.6-6.7))], LDL-Cholesterol ≥ 160 mg / dL [OR 2.1 (95% CI (1.7-2.5))]. there were significant associations for age, Scholarship and Geographic area among women and there were no significant associations for the covariates of Accompaniment at home, Socioeconomic level and Ingestion of alcoholic beverages in any of the two sexes. It is emphasized that although obesity is

associated with HGTW in both sexes, this association is greater in men. (Male OR: 13.0 (95% CI 8.9-19.1) Vs Female OR: 2.7 (95 % CI 2.2-3.5)) (Figure 1).

Discussion

In this study, we found that the prevalence of HTGW among the older adults in Colombia is higher in men than in women and there were significant differences in terms of sex and possible risk factors. HTGW was positively associated with sex, age, Geographic area, Smoke, Nutritional Status, Glycemia, Total-Cholesterol, HDL-Cholesterol, LDL-Cholesterol and Hemoglobin. The Smoke was inversely associated with HTGW. The findings of this study are consistent with published literature, but there are notable findings that are discussed below.

In the present study, the prevalence of HTGW in the older adults was 38.7%, a percentage that is much higher than that reported in Brazilian older adults (27.1%)(24) and Chinese (23.71%)(25). In this and other studies(9,24,26), women have the highest prevalence of HTGW, a result that is alarming since this phenotype ends up completing the ominous picture of metabolic syndrome in older adults women, in addition to the increase in body weight. it is a central factor in the development of metabolic alterations, especially in older adults women, due to the existing relationship between visceral fat accumulation(27) and factors associated with the development of hypertension(28) and diabetes mellitus type 2(29). The results of Colombia are also similar to those previously mentioned, in terms of higher percentages of prevalence in older adults nonsmokers, obese, with glycemia ≥ 100 mg / dL and total cholesterol ≥ 200 mg / dL. This fact is worrisome given the increase in older adults population around the world, cardiovascular risk, subclinical atherosclerosis and chronic kidney disease associated with this phenotype(30–32). On the other hand, and in line with the Brazilian results(24), a higher prevalence of HTGW was found in Colombians older than 70 years of age. These differences in the prevalence of HTGW may be due to socio-economic variations and cultural and dietary patterns in each country.

The Colombian results show marked differences in the prevalence of HTGW between men and women; while men showed high prevalences of HTGW in all study variables, women only found high prevalences in BMI variables and biological markers, this fact may correspond to the hormonal changes associated with the post-menopausal period, since low levels of estrogen cause changes in the distribution of body fat and this favors its central accumulation(33). Additionally, a clear association between anthropometric indexes of adiposity such as the perimeter of the waist in post-menopausal women and the development of metabolic syndrome with its nefarious cardiovascular consequences has been proven(34).

The strongly positive association between HTGW with the female sex, age, body mass index and high blood glucose levels, agree with that found in Brazilian older adults(24,32) This association makes clear the importance of anthropometric indicators as indirect evidence of metabolic disorders, since it has been shown that the increase in body volume provides an environment conducive to the development of metabolic disorders especially in women, after the menopause, period in which women reduce their levels of physical activity, increase their social stress and adopt inappropriate nutritional styles, which ultimately leads to an increase in body weight(35). The inverse association between smoking and HTGW is surprising in our study, although it has been reported that the cessation of smoking is linked to the increase in body weight and adiposity indexes(36).

Hyperglycemia is another characteristic hallmark of the metabolic syndrome in the general population, which is also present in the older adults population in the present study. Both prediabetes and diabetes are considered major risk factors for cardiovascular disease and their prevalence has been strongly associated with the HTGW phenotype(37,38); even in healthy subjects it has been demonstrated how the HTGW phenotype has been related to the presence of subclinical atherosclerosis(30). The presence of hyperglycemia leads chronically to the development of insulin resistance, the centerpiece of the pathogenesis in type 2 diabetes, which is established by the imbalance between the demands of insulin and its secretion, which, together with the increase in blood lipids, promote endothelial damage by increasing the thickness of the intima media in the arterial walls, a predictor of cardiovascular disease and its final outcome(39). Additionally, since diabetes mellitus is the most common cause of chronic kidney disease and brings with it high medical costs in its treatment(28), the recent association found between the presence of the HTGW phenotype and chronic kidney disease is striking(31).

The results of the present study show that although HTGW was associated with obesity and sociodemographic factors, the relationship was much stronger in men than in women; This is reflected in the fact that obese men show 13 (thirteen) times more likely to have HTGW and men in urban areas have 2.1 times more probability of HTGW. These results are similar to those reported in Peruvian older adults patients(40) and are also similar in that women are the ones with the highest probability of HTGW according to biological markers in the present study. These data suggest greater metabolic and cardiovascular complications(41).. The study of inequalities in body mass index and smoking behavior in 70 countries highlights a global trend towards a higher chronic disease risk burden among people with a lower socioeconomic status as countries become more urban(3).

The presence of the HTGW phenotype and its associated variables in Colombian older adults patients can be addressed through the prevention, diagnosis and treatment of cardiovascular anomalies. However,

more prospective research is needed to understand the predictive utility of the HTGW phenotype as an indicator of risk for cardiometabolic diseases(37).

One of the main strengths of this study is the use of SABE data. The SABE is a representative data source at the national level; therefore, reliable estimates of the status of the older adults in Colombia were obtained(42). The analytical sample used in the current study corresponds to the total of the older adults surveyed in SABE 2015, which allows a detailed analysis.

However, among the main limitations of this study is the nature of the research, which has a cross-sectional design that prevents the establishment of causal relationships between the presence of HTGW with sociodemographic and clinical factors valued in Colombian older adults population. Also, given the importance of variables such as the level of physical activity and measurements of the proinflammatory state in blood as important control elements in cardiovascular risk, it is necessary to propose in future investigations the inclusion of this type of variables. A third limitation of the present study is the lack of detailed information on nutrient intake, so the possibility of residual confusion due to measurement error can not be excluded.

Conclusions

In conclusion, there is a significant prevalence of HTGW in Colombian older adults and sociodemographic factors, lifestyles and biological markers that are associated with the HTGW phenotype. Older adults men showed higher probabilities in terms of age, schooling, geographic area, BMI and cholesterol concentrations; On the other hand, in older women, greater probabilities were revealed in biological markers. According to information searches made by the authors, these are the first results on the prevalence and factors associated with hypertriglyceridemic waist in Colombian older adults.

The measurement of the HTGW phenotype demonstrates the importance of clinical measures for the promotion of health and prevention of the disease, since the early detection and control of chronic noncommunicable diseases in the population directly impacts the direct and indirect medical costs linked to the treatment of the metabolic syndrome in the older adults.

Abbreviations

BMI: Body Mass Index

CI: Confidence Interval

Colciencias: Administrative Department of Science, Technology and Innovation

CVD: Cardiovascular Diseases

Hb: Hemoglobin

HTGW: Hypertriglyceridemic Waist

Minsalud: Ministry of Health and Social Protection of Colombia

HDL-c: High-Density Lipoprotein Cholesterol

IR: Interval Range

LDL-c: Low-Density Lipoprotein Cholesterol

MS: Metabolic Syndrome

NCDs: Non-communicable Diseases

OR: Odds Ratio

SABE: Survey on Health, Well-Being, and Aging

SPSS: Statistical Package for Social Science

T2DM: Type 2 Diabetes

WHO: World Health Organization

χ^2 : Chi Square Tests

Declarations

Ethics approval and consent to participate

According to the Declaration of Helsinki of the World Medical Association and Resolution 8430 of the then Ministry of Health of Colombia on technical, scientific and administrative standards for conducting research with humans, the SABE Colombia Survey was classified as a minimum risk. The study was endorsed by the Institutional Review Committee of Human Ethics of the Faculty of Health of the Universidad del Valle (minutes No. 09-014 and 011-015) and the Bioethics Committee of the University of Caldas (code CBCS-021). -14)(14). All participants

provided written informed consent to participate.

Consent for publication

Not applicable.

Availability of data and materials

All relevant data are presented in the manuscript and tables. The data underlying the results presented in the study are available from Official website of the Ministry of Health and Social Protection of Colombia <https://www.minsalud.gov.co/> and can be requested at the email repositorio@minsalud.gov.co; the name is needed to access the dataset used for this study is SABE 2015.

Competing interests

The authors declare that they have no conflicts of interest.

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Authors' contributions

DR made substantial contributions to conception and design, analysis and interpretation of data and has been involved in drafting the manuscript. YU made substantial contributions to conception and design, analysis and interpretation of data and has been involved in drafting the manuscript. AG made substantial contributions to analysis and interpretation of data and has been involved in drafting the manuscript. JM made substantial contributions to analysis and interpretation of data. All authors read and approved the final manuscript.

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Tables

Table 1. Characteristics of a representative sample of Colombian elders according to Gender. (quantitative variables)

Variable	TOTAL (n=3824)	MALE (n=2282)	FEMALE (n=1542)	p-Value
Age (years)*	69 (64-75)	69 (64-76)	68 (63-75)	0.000
BMI (Kg/m²)*	26.3 (22.9-29.7)	25.2 (22.3-27.9)	27.2 (23.4-30.9)	0.000
Waist circumference (cm)*	92.8 (85.1-100.5)	93.5 (86.1-101)	92 (84.8-100)	0.003
Fasting Glycemia (mg/dL)*	93 (86-103)	93 (85-102)	94 (86-103)	0.000
Total-Cholesterol (mg/dL)*	193 (167-221)	183 (159-207.3)	200 (172-227)	0.000
HDL-Cholesterol (mg/dL)*	44 (36-53)	40 (33-49)	46 (38-56)	0.000
LDL-Cholesterol (mg/dL)*	125 (102-149)	120 (98-142)	129 (104-154)	0.000
Fasting Serum Triglycerides (mg/dL)*	142 (106-194)	135 (100-188)	147 (109-198)	0.000
Fasting Serum Hemoglobin g/dl*	13.8 (12.8-14.9)	14.5 (13.5-15.6)	13.4 (12.5-14.3)	0.000

*Expressed as the median (interquartile range) and evaluated with Mann-Whitney U test.

Table 2. Characteristics of a representative sample of Colombian elders according to Gender. (qualitative variables)

Variable	Total n (%)	Male n (%)	Female n (%)	P-value ⁺
General	3824 (100.0)	2282 (100.0)	1542 (100.0)	Males vs Females
Age				
60 – 64 years	1124 (29.4)	413 (26.8)	711 (31.2)	0.003
65 – 69 years	919 (24.0)	360 (23.3)	559 (24.5)	
70 – 74 years	706 (18.5)	287 (18.6)	419 (18.4)	
75 – 79 years	517 (13.5)	229 (14.9)	288 (12.6)	
80 and more years	558 (14.6)	253 (16.4)	305 (13.4)	
Scholarship				
None	671 (17.5)	269 (17.4)	402 (17.6)	0.017
Basic primary	2254 (58.9)	871 (56.5)	1383 (60.6)	
Basic secondary and middle	641 (16.8)	283 (18.4)	358 (15.7)	
Technical or university	258 (6.7)	119 (7.7)	139 (6.1)	
Accompaniment at home				
Live with others	3501 (91.6)	1393 (90.3)	2108 (92.4)	0.026
Live alone	323 (8.4)	149 (9.7)	174 (7.6)	
Socioeconomic level				
Level I	1229 (32.1)	543 (35.2)	686 (30.1)	0.009
Level II	1617 (42.3)	617 (40.0)	1000 (43.8)	
Level III	867 (22.7)	340 (22.0)	527 (23.1)	
Level IV or more	111 (2.9)	42 (2.7)	69 (3.0)	
Geographic area				
Urban	3135 (82.0)	1207 (78.3)	1928 (84.5)	0.000
Rural	689 (18.0)	335 (21.7)	354 (15.5)	
Smoke				
Current smoker	358 (9.4)	212 (13.7)	146 (6.4)	0.000
Former smoker	1541 (40.3)	889 (57.7)	652 (28.6)	
No smoker	1925 (50.3)	441 (28.6)	1484 (65.0)	
Ingestion of alcoholic beverages				
One day or less a week	3744 (97.9)	1479 (95.9)	2265 (99.3)	0.000
Two days or more a week	80 (2.1)	63 (4.1)	17 (0.7)	
Nutritional Status				
Normal weight (18.5-24.9 kg/m ²)	1156 (30.3)	612 (39.9)	544 (23.9)	0.000
Underweight (<18.5 kg/m ²)	368 (9.7)	128 (8.3)	240 (10.5)	
Overweight (25-29.9 kg/m ²)	1379 (36.2)	590 (38.4)	789 (34.7)	
Obese (>30 kg/m ²)	907 (23.8)	205 (13.4)	702 (30.9)	
Abdominal Obesity				
No	890 (23.3)	588 (38.1)	302 (13.2)	0.000
Yes	2934 (76.7)	954 (61.9)	1980 (86.8)	
Glycemia				
< 100 mg/dL (optimum)	2625 (68.6)	1092 (70.8)	1533 (67.2)	0.017
≥ 100 mg/dL	1199 (31.4)	450 (29.2)	749 (32.8)	
Total-Cholesterol				
< 200 mg/dL (optimum)	2139 (55.9)	1021 (66.2)	1118 (49.0)	0.000
≥ 200 mg/dL	1685 (44.1)	521 (33.8)	1164 (51.0)	
HDL-Cholesterol				

≥ 40 mg/dL male or ≥ 50 mg/dL female (optimum)	1751 (45.8)	808 (52.4)	943 (41.3)	0.000
<40 mg/dL male or <50 mg/dL female	2072 (54.2)	733 (47.6)	1339 (58.7)	
LDL-Cholesterol				
≥ 160 mg/dl	3186 (83.3)	1357 (88.0)	1829 (80.1)	0.000
< 160 mg/dl (optimum)	638 (16.7)	185 (12.0)	453 (19.9)	
Triglycerides				
< 150 mg/dL (optimum)	2091 (54.7)	909 (58.9)	1182 (51.8)	0.000
≥ 150 mg/dL	1733 (45.3)	633 (41.1)	1100 (48.2)	
Hemoglobin				
≥13 g/dl male or ≥12 g/dl female (optimum)	3141 (82.1)	1258 (81.6)	1883 (82.5)	0.460
<13 g/dl male or <12 g/dl female	683 (17.9)	284 (18.4)	399 (17.5)	

*Statistical significance according to chi-squared test.

Table 3. Prevalence of the hypertriglyceridemic waist by sociodemographic and risk factors in a representative sample of Colombian elders according to Gender

Variables	Total (n=3824)	Hombres (n=2282)	Mujeres (n=1542)
	n (%)	n (%)	n (%)
Prevalence	1479 (38,7)	462 (30.0)	1017 (44.6)
Sex			
Male	462 (30,0)		
Female	1017 (44,6)		
Age			
60 - 64 years	456 (40,6)	149 (36.1)	307 (43.2)
65 - 69 years	358 (39,0)	103 (28.6)	255 (45.6)
70 - 74 years	288 (40,8)	95 (33.1)	193 (46.1)
75 - 79 years	197 (38,1)	57 (24.9)	140 (48.6)
80 and more years	180 (32,3)	58 (22.9)	122 (40.0)
Scholarship			
None	245 (36,5)	57 (21.2)	188 (46.8)
Basic primary	875 (38,8)	267 (30.7)	608 (44.0)
Basic secondary and middle	258 (40,2)	95 (33.6)	163 (45.5)
Technical or university	101 (39,1)	43 (36.1)	58 (41.7)
Accompaniment at home			
Live with others	1361 (38,9)	426 (30.6)	935 (44.4)
Live alone	118 (36,5)	36 (24.2)	82 (47.1)
Socioeconomic level			
Level I	429 (34,9)	129 (23.8)	300 (43.7)
Level II	668 (41,3)	211 (34.2)	457 (45.7)
Level III	339 (39,1)	107 (31.5)	232 (44.0)
Level IV or more	43 (38,7)	15 (35.7)	28 (40.6)
Geographic area			
Urban	1267 (40,4)	399 (33.1)	868 (45.0)
Rural	212 (30,8)	63 (18.8)	149 (42.1)
Smoke			
Current smoker	109 (30,4)	49 (23.1)	60 (41.1)
Former smoker	569 (36,9)	278 (31.3)	291 (44.6)
No smoker	801 (41,6)	135 (30.6)	666 (44.9)
Ingestion of alcoholic beverages			
One day or less a week	1452 (38,8)	443 (30.0)	1009 (44.5)
Two days or more a week	27 (33,8)	19 (30.2)	8 (47.1)
Nutritional Status			
Normal weight (18.5-24.9 kg/m2)	214 (18,5)	62 (10.1)	152 (27.9)
Underweight (<18.5 kg/m2)	114 (31,0)	21 (16.4)	93 (38.8)
Overweight (25-29.9 kg/m2)	666 (48,3)	255 (43.2)	411 (52.1)
Obese (>30 kg/m2)	483 (53,3)	122 (59.5)	361 (51.4)
Glycemia			
< 100 mg/dL (optimum)	872 (33,2)	268 (24.5)	604 (39.4)
≥ 100 mg/dL	607 (50,6)	194 (43.1)	413 (55.1)
Total-Cholesterol			
< 200 mg/dL (optimum)	657 (30,7)	259 (25.4)	398 (35.6)
≥ 200 mg/dL	822 (48,8)	203 (39.0)	619 (53.2)
HDL-Cholesterol			

≥ 40 mg/dL male or ≥ 50 mg/dL female (optimum)	321 (18,3)	116 (14.4)	205 (21.7)
<40 mg/dL male or <50 mg/dL female	1158 (55,9)	346 (47.2)	812 (60.6)
LDL-Cholesterol			
≥ 160 mg/dl	1139 (35,8)	389 (28.7)	750 (41.0)
< 160 mg/dl (optimum)	340 (53,3)	73 (39.5)	267 (58.9)
Hemoglobin			
≥13 g/dl male or ≥12 g/dl female (optimum)	1290 (41,1)	413 (32.8)	877 (46.6)
<13 g/dl male or <12 g/dl female	189 (27,7)	49 (17.3)	140 (35.1)

Figures

Figure 1

Factors associated with hypertriglyceridemic waist in a representative sample of older adults people in Colombia Group reference: Male (Sex), 60 – 64 years (Age), Technical or university (Scholarship), Live alone (Accompaniment at home), Level IV or more (Socioeconomic level), Rural (Geographic área), No smoker (Smoke), One day or less a week (Ingestion of alcoholic beverages), Normal weight (18.5-24.9

kg/m²) (Nutritional Status), < 100 mg/dL (Glycemia), < 200 mg/dL (Total-Cholesterol) ≥ 40 mg/dL male or ≥ 50 mg/dL female (HDL-Cholesterol) < 160 mg/dl (LDL-Cholesterol), ≥13 g/dl male or ≥12 g/dl female (Hemoglobin)

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