Cardiovascular Risk and Its Associated Factors in Health Care Workers in Colombia: A Study Protocol

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Abstract

Background: Cardiovascular diseases are the leading cause of mortality worldwide, for this reason, they are a public health problem. In Colombia, cardiovascular diseases are the main cause of mortality, having a death rate of 152 deaths per 100,000 population. There are 80% of these cardiovascular events that are considered avoidable.

Objective: The objective of the study is to determine the prevalence of the cardiovascular risk and its associated factors among the institution’s workers in order to design and implement interventions in the work environment which may achieve a decrease in such risk.

Methods: An analytical cross-sectional study was designed to determine the cardiovascular risk and its associated factors among workers of a high complexity health care institution. A self-applied survey will be conducted considering sociodemographic aspects, physical activity, diet, alcohol consumption, smoking, level of perceived stress, and personal and family history. In a second appointment, a physical examination will be made, as well as anthropometric measurements and blood pressure determination. Also, blood samples for evaluating total and high density lipoprotein cholesterol, triglycerides, and fasting blood sugar will be taken. A ten-year global risk for cardiovascular disease will be determined using the Framingham score. A descriptive analysis of the population’s characteristics and a stratified analysis by sex, age, and occupation will be made. Bivariate and multivariate analysis will be made using logistic regression models to evaluate the association between cardiovascular risk and the independent variables. The research protocol was approved by the Scientific and Technical Committee and the Ethics Committee on Research of the Fundación Cardiovascular de Colombia.

Results: The protocol has already received funding and the enrollment phase will begin in the coming months.

Conclusions: The results of this study will give the foundation for the design, implementation, and evaluation of a program based on promoting healthy lifestyles, such as performing regular physical activity and healthy food intake in order to avoid and/or control the cardiovascular risk in the workers of a high complexity health care institution.

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KEYWORDS

risk factors; metabolic syndrome; cardiovascular disease; prevalence; lifestyles
Introduction

Cardiovascular Risk Factors
Cardiovascular risk factors are biological or behavioral characteristics that increase the probabilities of developing a cardiovascular disease (CVD) or dying from this cause [1], in those who have them. According to the World Health Organization (WHO), risk factors are classified in behavioral (modifiable) and biological. Behavioral risk factors include smoking, alcohol consumption, unhealthy diet, and physical inactivity, while the biological risk factors include hypertension, overweight, obesity, diabetes mellitus, and hypercholesterolemia [2].

The high prevalence of these risk factors has led CVD to become the leading cause of mortality worldwide, and, therefore, a public health problem. According to the WHO in 2008, these diseases were responsible for 30% of the mortality worldwide, almost 17.3 million people [3], from which 7.3 million were caused by coronary disease and 6.2 million by cerebrovascular disease [4]. In accordance with the WHO projections, the number of deaths by CVD worldwide will increase from 17 million in 2004 to 23.4 million in 2030 [5].

CVD affect not only the global mortality rates, but also the life quality of the population. CVD are responsible for 151.377 million disability-adjusted life years, of which 41.34% are due to coronary disease and 31% due to cerebrovascular disease [5]. Additionally, 90% of all deaths by CVD occur in low and medium income countries [6]. In contrast, it is estimated that 80% of these cardiovascular events are avoidable [7].

In the Latin-American population, the age adjusted mortality rate due to potentially treatable conditions is 42.2 for diabetes mellitus, 60 for heart ischemic disease, and 45.4 for cerebrovascular diseases per 100,000 population [8]. Studies conducted in this population have found a higher prevalence of risk factors in women than in men, except for smoking, which is higher between men [9].

In Colombia, CVD are the leading cause of death, being responsible for 28% of all deaths, and having a mortality rate of 152 deaths per 100,000 population. The main risk factors are overweight (48%) and physical inactivity (43%) [6,10]. In a regional context, in Santander-Colombia, the most prevalent cardiovascular risk factors are: low fruit/vegetable intake (94%) (less than 5 portions/day), low level of physical activity (70.6%), and overweight or obesity (50.7%) [11].

Study of Health Care Workers in Bucaramanga, Santander
Otherwise, in a study conducted in health workers of a tertiary care institution in Bucaramanga, Santander, where the global cardiovascular risk and the prevalence of metabolic syndrome between workers were evaluated, a high prevalence of cardiovascular risk factors was determined, although the population was relatively young (median age was 44.3 years). In this study, the prevalence of hypertension was 54%, central obesity 40.3%, overweight 46.3%, obesity 21%, sedentary 82.4%, dyslipidemia 24%, smoking 10.4%, glucose intolerance 4.6%, and diabetes 1.6%. The ten-year global cardiovascular risk was 2.2% (5.2% in men and 1.4% in women). This study also established that male doctors were the population with the highest risk factors and the worst metabolic indices [12].

Fundación Cardiovascular de Colombia (FCV) is a high complexity health institution located in Floridablanca-Santander, Colombia. This institution is the biggest of the Colombian Northeast, and is specialized in the attention of CVD and their sequels. FCV’s health team is highly qualified and is dedicated to the prevention, diagnosis, and treatment of high complexity diseases, especially the cardiovascular ones. Given the importance of maintaining a healthy lifestyle, FCV proposes the development of this study, with the objective of determining the prevalence of the cardiovascular risk and its associated factors among the institution’s workers in order to design and implement interventions in the work environment which may achieve a decrease in this risk.

Methods

Study Design
The design of the study is an analytical cross-sectional one.

Study Participants and Eligibility
Workers from clinical and administrative areas of a high complexity health care institution specialized in the attention of CVD, of Floridablanca, Colombia (Fundación Cardiovascular de Colombia) will be included. No exclusion criteria will be considered.

Sample Size
The institution has 1235 workers; 745 belong to the clinical area and 490 to the administrative area. All workers will be invited to participate in the study.

In order to increase the participation in the study, a sensitization strategy will be implemented by sending, through email, invitations and messages regarding the benefits of maintaining healthy lifestyles.

Data Collection
During 6 months, data collection will be held through two appointments. During the first appointment, a self-applied survey for sociodemographic aspects, physical activity, diet, alcohol consumption, smoking, level of perceived stress, and personal and family history of cardiovascular risk will be conducted with prior written informed consent. A second appointment will be made with the indication of wearing comfortable clothes and an 8-10 hours fasting, without having made intense physical activity or having consumed alcohol. Physical examinations will be made, and anthropometric measures and blood pressure will be recorded. Also, trained and qualified staff will take two blood samples; the first sample will assess total cholesterol levels, high density lipoprotein (HDL) cholesterol, triglycerides (TG), and blood glucose (Figure 1 shows this).

All personnel (nurses, physician, and nutritionist) involved in the research were previously trained on the procedures, tools,
and instructional design for the collection of information, as well as for the quality control of data.

A second sample will be taken and stored in the FCV biobank in order to perform future measures of new biomarkers related to cardiovascular risk, such as homocysteine, tumor necrosis factor, and fibrinogen, which could be better predictors of cardiovascular risk than conventional markers [13].

**Figure 1.** Data collection. Total-C: total cholesterol; LDL: low density lipoprotein; HDL: high density lipoprotein; and TG: triglycerides.

**Study Variables**

**Sociodemographic Variables**

Sociodemographic variables include age, sex, socioeconomic level, monthly income, level of education, marital status, social security, occupation, first-degree family history and personal history of cerebrovascular or CVD before age 60, reproductive history, cancer history, and whether or not the participant is receiving treatment for a chronic disease.

**Smoking**

A participant’s smoking habit will be measured using the smoking index, which includes the daily smoked cigarettes, the number of years the person has smoked, and an estimation of the total amount of cigarettes. It is calculated by the formula, (average number of cigarettes smoked per day) x (number of years smoked)/20 [14].

**Alcohol Consumption**

Alcohol consumption will be measured by the alcohol intake frequency questionnaire, which has been validated in Colombia [15]. Through this questionnaire, the frequency of alcohol consumption by specific alcoholic drink (beer, brandy, rum, wine, whisky) during the last month will be investigated.

**Physical Activity Measurement**

Physical activity will be evaluated using the International Physical Activity Questionnaire, short version, which was adapted to the Colombian population, considering the urban social context of low and middle socioeconomic strata, since they represent the highest proportion of people in the country [16-18]. The questionnaire evaluates the intense physical activity, the moderated physical activity, the weekly walking time, and the sitting time. The following categories will be considered for the analysis,

- **Category 1**, or low, is for those who do not meet the criteria of the categories 2 and 3. They are considered inactive.
- **Category 2**, or moderate, is for any of the following: 3 or more days of vigorous physical activity at least for 20 minutes a day; or 5 or more days of moderate-intense activity or walking for at least 30 minutes a day; or 5 or more days of any combination of walking, moderate-intense activity, or vigorous-intense activity achieving at least 600 minutes per week (MET).
- **Category 3**, or high, is for either of the following two criteria: vigorous-intense activity for at least 3 days and accumulation of 1500 MET; or 7 or more days of any combination of walking, moderate-intense activity, or vigorous-intense activity achieving at least 3000 MET.
**Diet Measurement**
A questionnaire of frequency of food consumption during the last month will be given. This questionnaire will inquire about the most common food groups of the Colombian population. Also, the survey will inquire about some dietary habits.

**Level of Perceived Stress**
This variable will be measured through the perceived stress scale. Stress is a physical and psychological adaptive response to the demands and threats of the environment. The Perceived Stress Scale was designed with the purpose of discovering how stressful people perceive everyday life events. This scale is comprised of two dimensions: coping with stressors, and perception of stress [19,20].

This scale is composed of 14 items that assess how stressful the daily events in the last month are for people. This is a validated scale in the Colombian population, it has 5 answer options as in the Likert scale, where 0=never, 1=almost never, 2=occasionally 3=often, and 4= very often. The total score of the scale is obtained by inverting the scores of the items 4, 5, 6, 7, 9, 10, and 13 (as it follows, 0=4, 1=3, 2=2, 3=1, 4=0), and adding the 14 items. At a higher score, the higher is the level of perceived stress [19,20].

**Anthropometric Variables**

**Body Composition**
The recommendations of the Manual of the International Society for the Advancement of Kinanth, the international standards for the anthropometric evaluation [22], will be applied.

**Body Composition by Bioimpedance**
The body composition analyzer Tanita TBF-300A will determine this. The scale will measure the following variables: weight, body fat percentage, fat body mass (kilogram, kg), lean body mass (kg), and total body water (kg).

**Body Composition by Body Mass Index**
This will be determined as the relation between the height and the body weight (kg/m²). The WHO defines a normal range of body mass index (BMI) as between 18.5 and 24.9; overweight is defined as a BMI >25, obesity is classified in 3 classes: class I with a BMI between 30-34.9; class II with a BMI between 35-39.9; and class III or morbid obesity with a BMI >40 [23,24].

**Height**
This will be measured in a 0.1 centimeter (cm) scale using a stadiometer. Subjects will be asked to remove their shoes and any head ornaments that may affect the measurement. The measurement will be read carefully, verifying that the squad of the stadiometer is stuck to the wall and horizontal to the plane of measurement. The reader’s eyes will be on the same horizontal plane as the stadiometer, in order to register an accurate measurement.

**Waist Circumference**
The measuring tape will be positioned at the smallest circumference of the natural waist or in the midpoint between the inferior margin of the last rib and the iliac crest, with the reader standing in front of the subject in order to localize correctly the measurement zone. Subjects will be asked to breathe normally and the measurement will be taken during expiration with the arms alongside the body. The cutoff point will be the one established by the International Diabetes Federation (IDF) for Latin population, ≥90 cm for men and ≥80 cm for women [25].

**Hip Circumference**
Subjects will be asked to stand up with feet together and without contracting the buttocks. Positioning the measuring tape around the maximum circumference of the buttocks and checking that the tape’s position is horizontal all around the body is how the perimeter will be measured.

**Waist-Hip Ratio**
This will be calculated by dividing the waist circumference (cm) by the hip circumference (cm). All the anthropometric variables will be measured twice, and the average of them will be taken for the analysis. The cutoff point will be, >0.90 for men and >0.85 for women and/or BMI >30 kg/m [26].

**Blood Pressure**
There are 3 readings that will be taken at intervals of at least two minutes, with a digital sphygmomanometer (Omron HEM-7114), having the following recommendations.

1. Subject’s bladder must be empty, and they must have not smoked or drunk coffee 30 minutes before the measurement of the blood pressure (BP).
2. The patient should be seated comfortably for at least 5 minutes, with the back supported. The upper arm must be bared without constrictive clothing and supported at heart level. The legs should not be crossed and the feet must be on the floor.
3. The size of the cuff will be selected according to the circumference of the subject’s arm (sizes S, M, L)
4. The brachial artery will be identified and the cuff bladder will be positioned 2 cm above the antecubital fossa.

BP ≥140 mmHg/90 mmHg [27] will be considered hypertension, as well as being in medical treatment for hypertension.

**Biochemical Variables**

**Blood Samples**
Peripheral blood samples through venous puncture will be taken with the Vacutainer system, using three tubes of 7 ml without anticoagulant and two tubes of 4 ml with anticoagulant (Becton, Dickinson, and Co USA; Ref #366431yRef #366437, respectively). The samples will be centrifuged during 10 minutes at 3000 revolutions per minute; the component’s separation will be made in the laboratory within a biological safety cabinet. The vials will be labeled with the assigned code and stored at -80°C. Prior to storage, the date, number of vials, and person responsible for the procedure will be recorded.

**Fasting Blood Glucose**
Fasting prior to sample taking will be verified, as well as pharmacological treatment with hypoglycemic drugs or insulin. Prediabetes will be considered with fasting blood glucose values

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between 100 milligrams per deciliter (mg/dl) and 125 mg/dl, and diabetes will be considered with fasting blood glucose ≥126 mg/dl (7.0 millimole per Liter, mmol/L), according to the American Diabetes Association [28].

**Lipid Profile**

Analysis of the lipid profile will be made by colorimetric techniques. The kits are in agreement with the ones referenced by the largest observational studies in CVD and include the following characteristics.

**Total Cholesterol**

The enzymatic method for quantitative determination of cholesterol was used. For analytic sensitivity, the method is linear up to 19.3 mmol/L (750 mg/dl); inferior limit of detection, 0.08 mmol/L (3 mg/dl). Hypercholesterolemia will be considered with cholesterol level >200 mg/dl [29].

**Triacylglycerol**

The colorimetric method was used to determine triacylglycerol levels. The analysis is linear up to 11.4 mmol/L (1000 mg/dl); inferior limit of detection, 0.05 mmol/L (4 mg/dl). Hypertriglyceridemia will be considered with values above 150 mg/dl [29].

**High Density Lipoprotein Cholesterol**

This was quantified by colorimetric assay (HDL-C plus) using esterase and cholesterol oxidase coupled to polyethylene glycol. The analytical sensitivity-inferior limit of detection: 0.08 mmol/L (3 mg/dl). Values will be considered abnormal if they are lower than 40 mg/dl for men and lower than 50 mg/dl for women [29].

**Low Density Lipoprotein Cholesterol**

This was calculated by the formula in Friedewald [30]. Low density lipoprotein (LDL) cholesterol (mg/dl)=total cholesterol-HDL cholesterol-triacylglycerol/5 or LDL cholesterol (mmol/L)=total cholesterol-HDL cholesterol-triacylglycerol/2.2. This formula will be applied when TG are ≤4.5 mmol/L. Abnormal values will be considered with LDL >130 mg/dl [29,31,32].

The methods were selected for being described, standardized, and analyzed according to the guidelines of the National Committee for Clinical Laboratory Standards manual EP5-T2 [33].

Metabolic syndrome will be defined by the Adult Treatment Panel III classification [29,33] and by the classification of the IDF [34,35].

**Ten-Year Global Risk of Cardiovascular Disease**

The risk (myocardial infarction, heart failure, angina, ischemic stroke, hemorrhagic stroke, transient ischemic attack, peripheral arterial disease) will be measured using the Framingham score, which contemplates the following variables: sex, age, systolic blood pressure, arterial hypertension in treatment, smoking, diabetes mellitus, HDL and total cholesterol, and determining four risk categories (low <15%, moderated 15%–20%, high 20%–30%, and very high >30%) [36].

**Statistical Analysis**

A descriptive analysis of the characteristics of the study population will be done. Continuous variables will be described with means and SD or median and interquartile range (25%–75%), according to their distribution assessed by the Shapiro-Wilk test. Categorical variables will be described as proportions with a 95% confidence interval.

Stratified analysis by sex, age, and occupation will be made. To identify the differences between comparison groups, Student t test will be used for continuous variables with normal distribution, and the Mann-Whitney test for continuous variables with skewed distribution. Categorical variables will be compared using the chi-square test or the Fisher’s exact test. For categorical variables, the comparison of proportions test will also be used. A stratified analysis by sex, age, and occupation will be made. Bivariate and multivariate analysis will be made using logistic regression models or lineal regression models, depending on the outcome variable, to evaluate the association between cardiovascular risk and the independent variables.

Additionally, an analysis of the basic data of the individuals who refuse to participate in the study (gender, age, reason for not participation) will be performed, and these data will be compared with those of the participants to minimize selection bias.

**Ethics and Dissemination**

Research will be conducted in agreement with the 1993 Number 08430 Resolution from the Health Ministry of Colombia, by which the scientific, technical, and administrative standards for health research are established (Republic of Colombia, 1993) [37]. The Scientific and Technical Committee and the Ethics Committee on Research of the Fundación Cardiovascular de Colombia approved the research protocol. Written informed consent will be asked of all the participants of the study. The findings about this project will be disseminated through peer-reviewed publication and conference presentations.

**Results**

Currently, this study is in the phase of training the personnel responsible for conducting the surveys and measurements. Data collection phase is expected to begin in two months. It is also expected that the data collection phase will end in a time lapse of sixth months given the total study population.

**Discussion**

Given the interest of different institutions worldwide [38-41], which have emphasized the promotion of health in the workplace, this study will contribute evidence to occupational health by the establishment of the cardiovascular profile of the workers of a high complexity health care institute.

Determining the prevalence of the cardiovascular risk and its related factors will allow the design and assessment of the effectiveness of interventions directed to decrease or avoid those factors, which will comply with the WHO Strategy of Diet, Physical Activity, and Health. This strategy, established in article 64, “Workplaces are important environments for health
promotion and disease prevention. People should be able to adopt health decisions in their workplace in order to reduce their exposure to risk. It is precise to ensure the opportunity of adopting healthy decisions in the workplace, as well as supporting and promoting physical activity” [42].

This study seeks to show the impact that generates an institutional program of promotion, prevention, and control of worker’s risk factors. Thus, this will support the objectives of the 60th World Health Assembly, which highlights the global action plan on workers’ health 2008-2017 [43], where workplace and primary prevention of risk factors are considered the central focus for the economic development and world productivity.

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Conflicts of Interest
None declared.

References
1. Martínez AB, Arbués E. Enfermería global. online 2012, vol.11, n.28, pp. 31-40. ISSN: 2012. Prevalencia de los factores de riesgo cardiovascular en trabajadores de los sectores laborales secundario y terciario URL: http://scielo.isciii.es/scielo.php?pid=S1695-6142012000000038&script=sci_arttext[WebCite Cache ID 6aDimLd89]

2. Organización Mundial de la Salud (2006). Ginebra, Organización Mundial de la Salud. Ginebra: Ediciones de la OMS; 2006. El Manual de vigilancia STEPS de la OMS: el método STEPwise de la OMS para la vigilancia de los factores de riesgo de las enfermedades crónica URL: http://wqlibdoc.who.int/publications/2006/9789244593838_spa.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAbDiAqE]

3. Geneva, World Health Organization, 2011. In: Global status report on non-communicable diseases 2010. Geneva: WHO Press; 2010.

4. Geneva, World Health Organization, 2011. In: Global atlas on cardiovascular disease prevention and control. Geneva: WHO Press; 2011.

5. Geneva, World Health Organization, 2008. In: The global burden of disease: 2004 update. Geneva: WHO Press; 2004.

6. World HO. Non-communicable diseases country profiles 2011. Geneva: World Health Organization; 2011.

7. Evite los infartos de miocardio y los accidentes cerebrovasculares: no sea una víctima, protéjase. Ginebra: Ediciones de la OMS; 2005. OMS 2005 URL: http://www.world-heart-federation.org/fileadmin/user_upload/documents/publications-avoiding-spanish.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAbk7GyU]

8. Organización Panamericana de la Salud/Organización Mundial de la salud. Indicadores básicos. Washington: Organizacion Panamericana de la salud; 2013. Situación de salud en las Américas URL: http://www.paho.org/saludenlasamericas/index.php?option=com_docman&task=doc_view&gid=232&Itemid=%20[WebCite Cache ID 6aAc9bexa]

9. Miranda JJ, Herrera VM, Chirinos JA, Gómez LF, Perel P, Pichardo R, et al. Major cardiovascular risk factors in Latin America: A comparison with the United States. The Latin American Consortium of Studies in Obesity (LASO). PLoS One 2013;8(1):e54056 [FREE Full text] [doi: 10.1371/journal.pone.0054056] [Medline: 23349785]

10. Pan American Health. South America: Pan American Health Organization World Health Organization in . 2012 Edition; 2012. Health situation, policies and systems overview URL: http://new.paho.org/chp/images/PDFs/health%20in%20sam%202012%20(jan.13).pdf [accessed 2015-07-20] [WebCite Cache ID 6aAcWOySt]

11. Secretaría de salud de Santander, método S. Observatorio de salud pública en Santander. Bucaramanga, Colombia: División de Publicaciones Universidad Industrial de Santander; 2010. Factores de riesgo para enfermedades crónicas en Santander URL: http://www.who.int/chp/steps/2010_STEPS_Survey_Colombia.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAck7BtL]

12. Rincón O, Gamarra G, Jerez H. Acta Médica Colombiana. 2004. Valoración del riesgo cardiovascular global y prevalencia de síndrome metabólico en trabajadores de la salud del Hospital Universitario Ramón González Valencia URL: http://www.actamedicacolombiana.com/anexo/articulos/04-2004-05.pdf [accessed 2015-07-22] [WebCite Cache ID 6aDiviaAIt]

13. Wiseman S, Marlborough F, Doubl F, Webb DJ, Wardlaw J. Blood markers of coagulation, fibrinolysis, endothelial dysfunction and inflammation in lacunar stroke versus non-lacunar stroke and non-stroke: Systematic review and meta-analysis. Cerebrovasc Dis 2014;37(1):64-75 [FREE Full text] [doi: 10.1159/0003556789] [Medline: 24401164]

14. Villalba J, Martínez H. Rev Inst Nut Enf Resp. (1). 2004. Frecuencia del carcinoma broncopulmonar en pacientes fumadores diagnosticados en el Instituto Nacional de Enfermedades Respiratorias en el año URL: http://www.medigraphic.com/pdfs/iner/in-2004/n041e.pdf [accessed 2015-07-21] [WebCite Cache ID 6aEivIJMu]

15. Herrán O, Ardila M. Revista Chilena de Nutrición. 2009. Alcohol consumido y variables asociadas en Bucaramanga URL: http://www.redalyc.org/articulo.oa?id=46914639003 [accessed 2015-07-22] [WebCite Cache ID 6aDj9TFLt]
10.1161/CIRCULATION.105.169404 [FREE Full text] [Medline: 16157765]
20. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) 2003 Dec 01:1206-1252 [FREE Full text] [Medline: 12485966]
21. Lear SA, James PT, Ko GT, Kumanyika S. Appropriateness of waist circumference and waist-to-hip ratio cutoffs for different ethnic groups. Eur J Clin Nutr 2010 Jan;64(1):42-61. [doi: 10.1038/ejcn.2009.70] [Medline: 19672278]
22. the National High Blood Pressure Education Program Coordinating Committee, Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, et al. American Heart Association Journal, 2003; 42. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) 2003 Dec 01:1206-1252 [FREE Full text] [doi: 10.1161/01.HYP.0000107251.49515.e2]
23. Moreno M. Revista médica Clínica las Condes. 2012. Definición y clasificación de la obesidad URL: http://apps.elsevier.es/watermark/cf_srvkt=f10&epidcnt=article%3D90361737&epidcnt_user=0& execstatus=0&epidcnt_revista=202&accion=1&origen=zonadelectura&web=www.elsevier.es&lan=es&fichero=202v23n02a90361737pdf001.pdf [WebCite Cache ID 6aDjdityN]
24. World Health Organization. Obesity: Preventing and managing the global epidemic. In: Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 2000.
25. International Diabetes Federation. The IDF consensus worldwide definition of the Metabolic Syndrome URL: http://www.idf.org/metabolic-syndrome [accessed 2015-07-20] [WebCite Cache ID 6aAe4pohI]
26. Lear SA, James PT, Ko GT, Kumanyika S. Appropriateness of waist circumference and waist-to-hip ratio cutoffs for different ethnic groups. Eur J Clin Nutr 2010 Jan;64(1):42-61. [doi: 10.1038/ejcn.2009.70] [Medline: 19672278]
27. the National High Blood Pressure Education Program Coordinating Committee, Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, et al. American Heart Association Journal, 2003; 42. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) 2003 Dec 01:1206-1252 [FREE Full text] [doi: 10.1161/01.HYP.0000107251.49515.e2]
28. American Diabetes Association. Standards of medical care in diabetes--2014. Diabetes Care 2014 Jan;37:S14-S80. [doi: 10.2337/dc14-S014]
29. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third report of the National cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III) final report. Circulation 2002 Dec 17;106(25):3143-3421 [FREE Full text] [Medline: 12485966]
30. Friedewald WT, Levy RI, Fredrickson SD. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem 1972 Jun;18(6):499-502 [FREE Full text] [Medline: 4337382]
31. Grundy SM, Cleeman JI, Merz C Noel Baier, Brewer HB, Clark LT, Hunninghake DB, National Heart, Lung,Blood Institute, American College of Cardiology Foundation, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. Circulation 2004 Jul 13:110(2):227-239 [FREE Full text] [doi: 10.1161/01.CIR.0000133317.49796.0E] [Medline: 15249516]
32. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, National Heart, Lung,Blood Institute. Diagnosis and management of the metabolic syndrome: An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation 2005 Oct 25;112(17):2735-2752 [FREE Full text] [doi: 10.1161/CIRCULATIONAHA.105.169404] [Medline: 16157765]
33. National Committee for Clinical Laboratory Standards. Precision performance of clinical chemistry devices, 2nd ed. In: National Committee for Clinical Laboratory Standards. USA: NCCLS Publications; 1992:12.
34. Zimmet P, M M Alberti K George, Serrano RM. A new international diabetes federation worldwide definition of the metabolic syndrome: The rationale and the results. Rev Esp Cardiol 2005 Dec;58(12):1371-1376 [FREE Full text] [Medline: 16371194]

35. International Diabetes Federation. Brussels: IDF Communications; 2005. The IDF consensus worldwide definition of the metabolic syndrome URL: http://www.idf.org/webdata/docs/IDF_Meta_def_final.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAfGSF3q]

36. The Framingham heart study. Disponible en: URL: http://www.framinghamheartstudy.org/ [accessed 2015-07-20] [WebCite Cache ID 6aAfZRpbr]

37. Ministerio DS. Resolución 008430 por la cual se establecen las normas científicas, técnicas y administrativas para la investigación en salud. Santa Fe de Bogotá: Ministerio de salud; 1993. URL: http://www.unisabana.edu.co/fileadmin/Documents/Investigacion/comite_de_etica/Res__8430_1993_-_Salud.pdf [accessed 2015-07-22] [WebCite Cache ID 6aDk9HpfW]

38. Carta de Ottawa para el Fomento de la Salud. Ginebra, Organización Mundial de la Salud. 1986. Primera Conferencia Internacional sobre la Promoción de la Salud, Ottawa URL: http://www.fmed.uba.ar/depto/toxico1/carta.pdf [accessed 2015-07-22] [WebCite Cache ID 6aDkJMxdE]

39. Declaración de Yakarta sobre la Promoción de la Salud en el Siglo XXI. Yakarta. Ginebra, Organización Mundial de la Salud. 1997. Declaración de Yakarta sobre la Promoción de la Salud en el Siglo XXI. Cuarta Conferencia Internacional sobre la Promoción de la Salud: Nuevos actores para una nueva era: llevar la promoción de la salud hacia el siglo XXI, Yakarta. Ginebra, Organización Mundial de la Salud, 1997 URL: http://www.promotion.salud.gob.mx/dgps/descargas1/promocion/5_Declaracion_de_Yakarta.pdf [accessed 2015-07-22] [WebCite Cache ID 6aDkEMxdE]

40. Carta de Bangkok para la promoción de la salud en un mundo globalizado. Ginebra, Organización Mundial de la Salud. 2005. Carta de Bangkok para la promoción de la salud en un mundo globalizado. [Sexta Conferencia Internacional sobre la Promoción de la Salud, Tailandia. Ginebra, Organización Mundial de la Salud, 2005 URL: http://www.who.int/healthpromotion/conferences/6gchp/BCHP_es.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAfZRpbr]

41. Declaración de Luxemburgo sobre la promoción de la salud en el lugar de trabajo en la Unión Europea. Red europea de promoción de la salud en el trabajo, Luxemburgo. 1997. Declaracion de Luxemburgo URL: http://www.insht.es/PromocionSalud/Contenidos/Promocion%20Salud%20Trabajo/Documentos%20ENWHP/Documents%20estrategicos/Ficheros/22_1%20Declaracion_%20Luxemburgo.pdf [accessed 2015-07-20] [WebCite Cache ID 6aAfqP2Tq]

42. Organización Mundial de la Salud. Ginebra, Organización Mundial de la Salud, 2004. In: Estrategia Mundial sobre el Régimen Alimentario, Actividad Física y Salud. 2004 Presented at: 57ª Asamblea Mundial de la Salud; May, 2004; Geneva URL: http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_spanish_web.pdf

43. Salud de los trabajadores: Plan de acción mundial. 60ª Asamblea mundial de la salud. In: Organización Mundial de la Salud. 2007 Presented at: 60.* ASAMBLEA MUNDIAL DE LA SALUD; May 23, 2007; Geneva URL: http://www.who.int/occupational_health/WHO_health_assembly_sp_web.pdf

Abbreviations

BMI: body mass index  
BP: blood pressure  
cm: centimeter  
COLCIENCIAS: Colombian Institute for the Development of Science and Technology  
CVD: cardiovascular disease  
FCV: Fundación Cardiovascular de Colombia  
HDL: high density lipoprotein  
IDF: International Diabetes Federation  
kg: kilogram  
LDL: low density lipoprotein  
MET: minutes per week  
mg/dl: milligrams per deciliter  
mmol/L: millimole per liter  
TG: triglycerides  
WHO: World Health Organization
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