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Determination of different scales of cardiovascular risk in 1.979 spanish informatics workers

Determinación de diferentes escalas de riesgo cardiovascular en 1.979 informaticos españoles

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Abstract

Introduction: Cardiovascular diseases are the leading cause of morbidity and mortality in almost all countries of the world. The aim of this study was to determine the level of cardiovascular risk in the group of computer workers.
Methods: A descriptive, cross-sectional study was carried out in 1979 computer scientists (1684 men and 2945 women) in which different scales related to cardiovascular risk were assessed: overweight and obesity, body fat estimation, cardiometabolic indicators, atherogenic indices, non-alcoholic fatty liver disease risk scales and cardiovascular risk scales.
Results: Among the computer scientists, a high prevalence of smoking was found (30.8% in men and 33.2% in women), a prevalence of obesity determined by BMI of 14.6% in women and 19.2% in men. The prevalence of hypertension was much higher in men (27.6%) than in women (6.8%). Metabolic syndrome with IDF criteria was present in 3.4% of women and 12.9% of men. Hypertension was observed in 27.6% of men and 6.8% of women. Finally, 10.3% of men had moderate or high risk levels according to the REGICOR model, while the percentage in women was 4.7%.
Conclusions: The level of cardiovascular risk found in IT workers can be considered high for a population with an average age of 37 years and especially in men.

Keywords: Cardiovascular risk, obesity, metabolic syndrome, body fat mass, atherogenic indices, workers.

Resumen

Introducción: Las enfermedades cardiovasculares son la principal causa de morbilidad y mortalidad en casi todos los países del mundo. El objetivo de este estudio fue determinar el nivel de riesgo cardiovascular en el grupo de trabajadores informáticos.
Métodos: Se realizó un estudio descriptivo y transversal en 1979 informáticos (1684 hombres y 2945 mujeres) en el que se valoraron diferentes escalas relacionadas con el riesgo cardiovascular: sobrepeso y obesidad, estimación de la grasa corporal, indicadores cardiometabólicos, índices aterogénicos, escalas de riesgo de enfermedad de hígado graso no alcohólico y escalas de riesgo cardiovascular.
Resultados: Entre los informáticos se encontró una alta prevalencia de tabaquismo (30,8% en hombres y 33,2% en mujeres), una prevalencia de obesidad determinada por el IMC de 14,6% en mujeres y 19,2% en hombres. La prevalencia de hipertensión fue mucho mayor en los hombres (27,6%) que en las mujeres (6,8%). El síndrome metabólico con criterios de la FID estaba presente en el 3,4% de las mujeres y el 12,9% de los hombres. La hipertensión se observó en el 27,6% de los hombres y en el 6,8% de las mujeres. Por último, el 10,3% de los hombres presentaban niveles de riesgo moderado o alto según el modelo REGICOR, mientras que el porcentaje en las mujeres era del 4,7%.
Conclusiones: El nivel de riesgo cardiovascular encontrado en los trabajadores de IT puede considerarse alto para una población con una edad media de 37 años y especialmente en los hombres.

Palabras clave: Riesgo cardiovascular, obesidad, síndrome metabólico, masa grasa corporal, índices aterogénicos, trabajadores.

Introduction

The World Health Organization launched in 2013 a global action plan for all countries to reduce premature mortality, this initiative focused on strengthening health, services and public policies with the aim of preventing and managing four major non-communicable diseases: cardiovascular diseases, cancer, diabetes mellitus and chronic respiratory diseases as these are the major contributors to global morbidity and mortality. Of all of them, cardiovascular diseases are the most susceptible to obtain rapid changes[1].

The main risk factors for cardiovascular diseases are well known and include mainly smoking, high blood pressure, dyslipidemia, diabetes mellitus, and obesity; thus, these are the most commonly used parameters to assess cardiovascular risk in the general population[2].

Low physical activity (considered as less than 30 minutes of moderate intensity at least 5 days per week, less than 20 minutes of vigorous intensity physical activity at least 3 days per week or less than 600 metabolic equivalents-min per week) is part of the cardiovascular risk factors although it does not rank first[1].

Computer science is considered as a science with a low volume of motor activity, sedentary, with prolonged postures in time and intense hours of mental work, elements that together with the ergonomic factors of the work can cause different discomforts and ailments that have been qualified as diseases of this profession[3].

Control over excessive workloads and time pressures have been studied in these workers, factors that can increase work stress and foster or exacerbate a psychophysiological response, as well as the potential development of musculoskeletal symptoms and disorders[4]. The most prevalent health disorders in these professionals have been musculoskeletal, ocular, and mental disorders[5]. Studies of vision impairment have also been described, although it has been noted that the incidence of eye symptoms was somewhat lower than the incidence of symptoms in the neck, shoulders, arms, and hands[6]. Many studies have been aimed at determining musculoskeletal conditions among IT or computer workers[7-10]. Other conditions that can appear in computer scientists include cardiovascular and kidney problems, obsessive behaviors, eyestrain, migraines, weight gain[11]. In summary, stress, headache, back pain, cervical pain, gastric problems, astigmatism, chest tightness, breathing difficulties, sadness, irritability, isolation, obesity, hypertension, depression, cardiovascular and renal problems are among the common conditions of these professionals[12].

Although the possible occurrence of cardiovascular diseases is mentioned in several of these investigations, we have not found epidemiological studies that analyze the incidence of cardiovascular risk in this group of workers, which is why our work has set out to perform a detailed analysis of the factors and parameters related to cardiovascular risk among IT professionals.

Methods

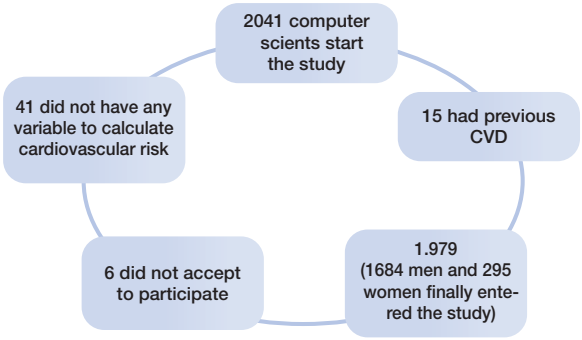
A retrospective and cross-sectional study was carried out in 1.979 informatics scientist between January 2019 and December 2020. The workers were selected based on their attendance to periodic occupational medical examinations.

Selection criteria:

- Belongs to one of the participating companies.
- Accepts participating in the study.
- Not having suffered a serious cardiovascular disease (CVD) event in the past (myocardial infarction, cerebrovascular disease...).

Of the 2.041 informatics scientist initially included in the study, 41 were excluded due to not having data from all the necessary variables to calculate the cardiovascular risk indicators; 15 had suffered CVD previously; and 6 did not give permission to participate in the study. The final number of workers included in the study was 1.979. See flow chart in **figure 1**.

Figure 1: Participant flow chart.



Anthropometric, clinical and analytical measures were carried out by the healthcare professionals of the different occupational health units that participated in the study, after standardizing the measurement techniques.

The following parameters related to cardiovascular risk were included in the assessment:

- Weight and height: weight (in kilograms) and height (in cm) were determined with a height bar scale (model: SECA 700 with a capacity of 200 kg and 50-gram divisions, to which was added a SECA 220 telescopic height bar with millimetric division and 60-200 cm intervals).
- Abdominal waist circumference (cm): was measured

with a SECA model 200 tape measure. The individual was placed in a standing position, with the feet together and the trunk erect, the abdomen relaxed and the upper extremities hanging on both sides of the body. The tape measure was then placed parallel to the ground at the height of the last floating rib.

- Blood pressure: blood pressure was measured in the supine position with a calibrated OMRON M3 automatic sphygmomanometer and after a 10-minute rest period. Three determinations were made at one-minute intervals, obtaining the mean of the three. Hypertension was considered when the values were equal to or higher than 140 mm Hg systolic or 90 mm Hg diastolic blood pressure.
- Blood glucose, total cholesterol and triglycerides: These were determined by peripheral venipuncture and after fasting for at least 12 hours. Automated enzymatic methods were used. HDL was determined by precipitation with dextran sulfate Cl2Mg. LDL was calculated using the Friedewald formula (provided that triglycerides were less than 400 mg/dl). All the above values are expressed in mg/dl.
  Friedewald's formula: LDL = total cholesterol –HDL– triglycerides / 5
- Blood glucose values were classified according to the recommendations of the American Diabetes Association[13], considering hyperglycemia >125 mg/dL. High cholesterol >239 mg/dL, high LDL >159 mg/dL, and high triglycerides >200 mg/dL were considered high.

The cut-off points for the atherogenic indexes were[14]:

- Cholesterol/HDL (considered as high values >5 in men and >4.5 in women),
- LDL/HDL and Triglycerides/HDL (high values >3)

Metabolic syndrome was determined using three models:

a) The NCEP ATP III (National Cholesterol Educational Program Adult Treatment Panel III), which considers metabolic syndrome when three or more of the following factors are present: waist circumference >88 cm in women and 102 cm in men; triglycerides >150 mg/dL or specific treatment for this lipid disorder; blood pressure >130/85 mm Hg; HDL <40 mg/dL in women or <50 mg/dL in men or specific treatment is followed, and fasting blood glucose >100 mg/dL or specific glycemic treatment.

b) The International Diabetes Federation (IDF) model[15] establishes as necessary the presence of central obesity, defined by a waist circumference >80 cm in women and >94 cm in men, and also at least two of the other factors mentioned above for ATP III.

c) The JIS[16] model, which uses the same criteria as the NCEP ATPIII, but the waist cut-off points are those seen in the IDF model.

Hypertriglyceridemic waist[17] required: waist circumference greater than 94 cm in men and greater than 80 cm in women and triglycerides greater than 150 mg/dl or treatment of hypertriglyceridemia.

The REGICOR scale is an adaptation of the Framingham scale to the Spanish population[18] and estimates the risk of suffering a cerebrovascular event over a 10-year period. It can be applied between 35 and 74 years of age. It is considered moderate risk >5% and high risk >10%[19]. The SCORE scale is the version recommended for Spain[20-21] and estimates the risk of suffering a fatal cerebrovascular event over a 10-year period. It is used between 40 and 65 years of age and we speak of risk >4% and high >5%. To determine vascular age, calibrated tables[22] are used to assess the degree of aging of the arteries and can be calculated from the age of 30 years.

Vascular age with the Framingham model[23] uses age, sex, HDL-c, total cholesterol, systolic blood pressure, antihypertensive treatment, smoking and diabetes. The scale can be calculated from the age of 30 years. Vascular age with the SCORE[24] model is calculated using age, sex, systolic blood pressure, smoking and total cholesterol. As with the SCORE scale from which it derives, it can be calculated in people between 40 and 65 years of age. An interesting concept applicable to both vascular ages is avoidable lost life years (ALLY)[25], which can be defined as the difference between biological age (BI) and vascular age (VE).

ALLY = vascular age –biological age.

The different indicators are calculated using the following formulas:

Visceral adiposity index[26] (VAI)

Male:

$$VAI = \left(\frac{WC}{39{,}68 + (1{,}88 \times BMI)}\right) \times \left(\frac{TG}{1{,}03}\right) \times \left(\frac{1{,}31}{HDL}\right)$$

Female:

$$VAI = \left(\frac{WC}{36{,}58 + (1{,}89 \times BMI)}\right) \times \left(\frac{TG}{0{,}81}\right) \times \left(\frac{1{,}52}{HDL}\right)$$

Waist triglyceride index[27] Waist circumference (cm) x triglycerides (mmol).

Body shape index (ABSI)[28].

$$ABSI = \frac{WC}{BMI^{2/3} \times height^{1/2}}$$

Normalized weight-adjusted index (NWAI)[29]

[(weight/10) – (10 x height) + 10] with weight measured in kg and height in m.

Conicity index[30]

$$\frac{\text{waist circumference (in metres)}}{0{,}109} \times 1\sqrt{\frac{\text{Weight (in kilogram)}}{\text{Height (in metres)}}}$$

Lipid accumulation product[31]
- In men: (waist circumference (cm) - 65) x (triglyceride concentration (mMol)).
- In women: (waist circumference (cm) - 58) x (triglyceride concentration (mMol))

Cardiometabolic index[32]
Waist-to-height ratio x atherogenic index triglycerides / HDL-c.

Triglyceride glucose index[33] = LN (triglycerides [mg/dl] × glycaemia [mg/dl]/2).

Triglyceride glucose index-BMI, Triglyceride glucose index-waist[34]

TyGindex-BMI = TyGindex x BMI
TyGindex-waist = TyGindex x waist

Atherogenic dyslipidemia is characterized by high triglyceride concentrations (>150 mg/dL), low HDL (<40 mg/dL in men and <50 mg/dL in women) and normal or slightly elevated LDL[35].

Body mass index (BMI) was calculated by dividing weight by height in squared meters. Obesity was considered over 30. The waist-to-height ratio was considered risky over 0.50[36].

Body Surface Index[37] (BSI). BSA is calculated using the DuBois formula where w represents weight in kg and h represents height in cm.

$$BSA = w^{0{,}425} * h^{0{,}725} * 0{,}007184$$

$$BSI = \frac{WEIGHT}{\sqrt{BSA}}$$

It is considered diabesity when the person has blood glucose levels above 126 mg/dl or is under treatment for diabetes and has a BMI of 30 kg/m^2 or more[38].

Formulas to estimate the percentage of body fat:

- Relative fat mass[39] 76- (20 x (height/p waist))

Where the height and waist circumference are expressed in meters. The cut-off points for obesity are 33.9% in women.

- CUN BAE[40] (University of Navarra Body Adiposity Estimator Clinic) using the following formula:

-44.988 + (0.503 x age) + (10.689 x sex) + (3.172 x BMI) - (0.026 x BMI^2) + (0.181 x BMI x sex) - (0.02 x BMI x age) - (0.005 x BMI^2 x sex) + (0.00021 x BMI^2 x age)

- ECORE-BF (Equation COrdoba Estimator Body Fat)[41]

–97.102 + 0.123 (age) + 11.9 (gender) + 35.959 (LnBMI)
Male = 0 Female = 1

Where male is 0 and female 1. The CUN BAE and ECORE-BF cut-off points for obesity are 35% in women 25% in men.

- Palafolls formula[42].
Men = (BMI/waist] *10) + BMI. Women = (BMI/waist] *10) + BMI + 10.

- Deuremberg formula[43].
1,2 x (BMI) + 0,23 x (age) – 10,8 x (gender) – 5,4
Male = 0 Female = 1

Body Roundness Index[44] (BRI)
BRI = 365.2 – 365.5 × √ (1 – (((wc/2π)2)/[(0.5 × height)]^2))
Where WC represents the waist circumference.

Non-alcoholic fatty liver:

- Fatty liver index (FLI)[45]

$$FLI = (e^{0.953*\log_e(\text{triglycerides}) + 0.139*BMI + 0.718*\log_e(GGT) + 0.053*\text{waist circumference} - 15.745}) / (1 + e^{0.953*\log_e(\text{triglycerides}) + 0.139*BMI + 0.718*\log_e(GGT) + 0.053*\text{waist circumference} - 15.745}) \times 100$$

FLI scores of 60 and above indicate high risk.

- Hepatic steatosis index (HSI)[46]
HSI = 8 x ALT/AST + BMI (+ 2 if type 2 diabetes yes, + 2 if female)

- Zhejian University index (ZJU)[47]
BMI + FPG mmol L + TG mmol L+ 3 ALT/AST + 2 if female

- Fatty liver disease index (FLD)[48]
BMI + TG + 3 × (ALT/AST) + 2 × Hyperglycaemia (presence= 1; absence = 0)

Values <28.0 or >37.0 excluded the possibility of NAFLD

BMI ≥ 28 = 1 point, AST/ALT ≥0.8 = 2 points, type 2 diabetes mellitus = 1 point.
Cut off for high risk 2 points

A smoker was considered to be any person who had regularly consumed at least 1 cigarette/day (or the equivalent in other types of consumption) in the last month, or had quit smoking less than one year ago.

Statistical analysis

A descriptive analysis of the categorical variables was carried out, calculating the frequency and distribution of responses for each of them. For quantitative variables, the mean and standard deviation were calculated, and for qualitative variables the percentage was calculated. A bivariate association analysis was performed using the χ^2 test (with a correction with the Fisher's exact statistical test, when conditions required so) and a Student's t-test for independent samples. For the multivariate analysis, binary logistic regression was used with the Wald method, with the calculation of the Odds-ratio and the Hosmer-Lemeshow goodness-of-fit test was performed. Statistical analysis was performed with the SPSS 27.0 program, and a p value of <0.05 was considered as statistically significant.

Considerations and ethical aspects

The study was approved by the Clinical Research Ethics Committee of the Illes Balears Health Area in November 2020. The procedures were performed following the ethical standards of the institutional research committee and with the 2013 Declaration of Helsinki. All patients signed written informed consent documents before participating in the study.

Results

The average age of the IT workers included in our study is not too high, around 37 years old. Women smoke more than men. The clinical and analytical variables are more unfavorable in men, the differences being statistically significant in most cases as can be seen in **table I**.

Most of the indicators related to cardiovascular risk analyzed in this study show higher mean values in men, as is the case for non-alcoholic fatty liver disease risk scales, cardiometabolic indicators, atherogenic indices and cardiovascular risk scales. When overweight and obesity scales are assessed we can see that those not related to body fat also show higher mean values in men, while when body fat predictive scales are analyzed the mean values are higher in women, as it is known that normal body fat values in women are higher than in men. The differences observed between the sexes for all scales show statistical significance. The complete data can be found in **table II**.

Something similar to that observed with the mean values occurs when analyzing the prevalence of altered values of the scales related to cardiovascular risk, in this case all the scales (overweight and obesity, non-alcoholic fatty liver disease risk, cardiometabolic risk, atherogenic indices and cardiovascular risk scales) show higher prevalence in men, with the differences observed always being statistically significant. All data can be found in **table III**.

Table I: Characteristics of the informatics scientist by gender.

	Women n=295 Mean (SD)	Men n=1684 Mean (SD)	p-value
Age (years)	36.2 (8.5)	37.3 (8.8)	0.051
Height (cm)	163.5 (6.5)	176.5 (7.1)	<0.0001
Weight (cm)	66.3 (15.0)	82.7 (15.2)	<0.0001
Waist (cm)	75.2 (11.5)	86.8 (11.8)	<0.0001
Systolic Blood Pressure (mmHg)	115.2 (12.8)	128.5 (14.1)	<0.0001
Diastolic Blood Pressure (mmHg)	71.8 (9.6)	78.3 (10.8)	<0.0001
Total cholesterol (mg/dl)	187.8 (32.6)	189.2 (32.3)	0.531
HDL-c (mg/dl)	59.5 (9.4)	51.8 (8.4)	<0.0001
LDL-c (mg/dl)	111.1 (29.9)	114.3 (34.1)	0.129
Triglycerides (mg/dl)	86.1 (42.5)	116.2 (65.4)	<0.0001
Glycaemia (mg/dl)	86.2 (10.5)	89.3 (14.9)	0.001
ALT (U/l)	18.1 (9.8)	30.1 (18.2)	<0.0001
AST (U/l)	14.6 (5.3)	22.0 (13.0)	<0.0001
GGT (U/l)	17.2 (11.7)	32.1 (29.7)	<0.0001
	Percentage	**Percentage**	**p-value**
18-29 years	24.4	21.0	0.015
30-39 years	40.3	38.4	
40-49 years	29.5	32.0	
50-69 years	5.8	8.6	
Non-Smokers	66.8	69.2	0.021
Smokers	33.2	30.8	

Table II: Mean values of the different CVR scales according to gender in informatics scientist.

	Women n=295 Mean (SD)	Men n=1684 Mean (SD)	p-value
Waist to height ratio	0.46 (0.07)	0.49 (0.06)	<0.0001
Body mass index (BMI)	24.8 (5.2)	26.5 (4.4)	<0.0001
CUN BAE	34.0 (7.2)	24.9 (6.3)	<0.0001
ECORE-BF	33.9 (7.1)	24.9 (5.9)	<0.0001
Relative fat mass	31.7 (5.6)	22.7 (4.9)	<0.0001
Palafolls formula	38.0 (5.5)	29.6 (4.5)	<0.0001
Deuremberg formula	32.6 (6.6)	24.2 (5.9)	<0.0001
Body surface index	50.3 (8.6)	58.4 (8.0)	<0.0001
Normalized weight adjusted index	0.3 (1.4)	0.6 (1.4)	<0.0001
Body roundness index	2.7 (1.3)	3.3 (1.2)	<0.0001
Body shape index	0.070 (0.006)	0.074 (0.006)	<0.0001
Visceral adiposity index	2.5 (1.5)	6.8 (5.0)	<0.0001
Conicity index	1.1 (0.1)	1.2 (0.1)	<0.0001
Fatty liver index	16.4 (21.1)	36.7 (27.5)	<0.0001
Hepatic steatosis index	34.9 (5.5)	37.5 (6.5)	0.001
Zhejiang University index	35.6 (5.4)	37.3 (5.3)	0.008
Fatty Liver Disease index	28.8 (5.2)	32.3 (5.1)	<0.0001
Lipid accumulation product	17.9 (18.7)	30.7 (28.1)	<0.0001
Triglyceride glucose index	8.1 (0.4)	8.4 (0.5)	<0.0001
Triglyceride glucose index-BMI	201.8 (46.6)	224.2 (44.4)	<0.0001
Triglyceride glucose index-waist	612.1 (106.6)	733.1 (121.3)	<0.0001
Triglyceride glucose index-WtHR	3.7 (0.6)	4.2 (0.6)	<0.0001
Waist triglyceride index	74.3 (43.4)	116.1 (72.3)	<0.0001
ALLY vascular age SCORE*	1.9 (4.7)	5.6 (6.0)	<0.0001
SCORE scale*	0.2 (0.9)	0.9 (1.5)	<0.0001
ALLY vascular age Framingham**	-2.8 (8.8)	4.5 (9.0)	<0.0001
REGICOR scale***	1.4 (1.2)	2.7 (1.6)	<0.0001
Nº factors of metabolic syndrome NCEP ATPIII	0.6 (0.9)	1.2 (1.1)	<0.0001
Nº factors of metabolic syndrome JIS	0.7 (0.9)	1.6 (1.3)	<0.0001
Cardiometabolic index	0.7 (0.5)	1.2 (0.9)	<0.0001
Atherogenic index total cholesterol/HDL-c	3.2 (0.6)	3.8 (1.0)	<0.0001
Atherogenic index triglycerides/HDL-c	1.5 (0.8)	2.4 (1.6)	<0.0001
Atherogenic index LDL-c/HDL-c	1.9 (0.6)	2.3 (0.9)	<0.0001

(*) Women n=104 Men n= 684 (**) Women n= 223 Men n=1331 (***) Women n=169 Men n=1030

Table III: Prevalence of altered values of the different CVR scales by gender in informatics scientist.

	Women n=295 Percentage	Men n=1684 Percentage	
Waist to height ratio > 0.50	21.0	37.3	<0.0001
Body mass index obesity	14.6	19.2	<0.0001
CUN BAE obesity	38.6	45.2	<0.0001
ECORE-BF obesity	37.6	45.4	<0.0001
Relative fat mass obesity	26.8	47.0	<0.0001
Palafolls formula obesity	68.5	87.6	<0.0001
Deuremberg formula obesity	61.7	68.2	<0.0001
Hypertension	6.8	27.6	<0.0001
Total cholesterol ≥ 200 mg/dl	31.5	36.6	0.040
LDL-c ≥ 130 mg/dl	24.7	31.2	0.025
Triglycerides ≥ 150 mg/dl	5.1	21.4	<0.0001
Glycaemia 100-125 mg/dl	6.4	10.8	<0.0001
Glycaemia ≥ 126 mg/dl	0.3	1.8	<0.0001
Metabolic syndrome NCEP ATPIII	4.1	12.8	<0.0001
Metabolic syndrome IDF	3.4	12.9	<0.0001
Metabolic syndrome JIS	4.7	22.7	<0.0001
Atherogenic dyslipidemia	1.0	5.5	<0.0001
Lipid triad	0.0	1.2	<0.0001
Hypertriglyceridemic waist	2.0	7.9	<0.0001
Atherogenic index total cholesterol/HDL-c moderate-high	6.4	12.9	<0.0001
Atherogenic index triglycerides/HDL-c high	4.1	23.4	<0.0001
Atherogenic index LDL-c/HDL-c high	6.1	20.4	<0.0001
SCORE scale moderate-high	1.9	11.0	<0.0001
REGICOR scale moderate-high	4.7	10.3	<0.0001
Fatty liver index high risk	7.5	22.7	<0.0001
Hepatic steatosis index high risk	35.5	54.3	<0.0001
ZJU index high	25.8	37.6	<0.0001
Fatty liver disease index high	41.9	61.5	<0.0001

Table IV: Logistic regression analysis.

	≥ 50 years OR (95% CI)	Men OR (95% CI)	Smokers OR (95% CI)
Waist to height ratio > 0.50	ns	2.24 (1.66)	ns
Body mass index obesity	1.83 (1.27-2.63)	ns	1.30 (1.02-1.65)
CUN BAE obesity	4.11 (2.85-5.93)	ns	ns
ECORE-BF obesity	3.97 (2.76-5.71)	1.34 (1.04-1.73)	ns
Relative fat mass obesity	ns	2.41 (1.83-3.17)	ns
Palafolls formula obesity	2.27 (1.23-4.16)	3.20 (2.40-4.26)	ns
Deuremberg formula obesity	6.61 (4.46-9.80)	3.50 (2.87-4.65)	ns
Hypertension	3.27 (2.34-4.58)	5.16 (3.23-8.25)	ns
Total cholesterol ≥ 200 mg/dl	3.09 (2.22-4.30)	ns	ns
LDL-c ≥ 130 mg/dl	3.10 (2.24-4.30)	1.34 (1.00-1.78)	ns
Triglycerides ≥ 150 mg/dl	2.11 (1.48-3.01)	4.98 (2.92-8.50)	ns
Glycaemia 100-125 mg/dl	4.68 (3.26-6.72)	1.88 (1.16-3.05)	ns
Glycaemia ≥ 126 mg/dl	6.33 (2.97-13.49)	ns	ns
Metabolic syndrome NCEP ATPIII	4.62 (3.20-6.65)	3.37 (1.85-6.14)	ns
Metabolic syndrome IDF	2.44 (1.63-3.63)	4.17 (2.18-7.98)	ns
Metabolic syndrome JIS	3.51 (2.50-4.93)	5.84 (3.36-10.14)	ns
Atherogenic dyslipidemia	4.13 (2.51-6.79)	5.32 (1.67-16.96)	ns
Hypertriglyceridemic waist	1.81 (1.08-3.03)	4.03 (1.76-9.22)	ns
Atherogenic index total cholesterol/HDL-c moderate-high	2.74 (1.86-4.02)	2.10 (1.29-3.42)	ns
Atherogenic index triglycerides/HDL-c high	2.43 (1.72-3.44)	7.07 (3.92-12.76)	ns
Atherogenic index LDL-c/HDL-c high	2.71 (1.92-3.84)	3.85 (2.35-6.31)	ns
SCORE scale moderate-high	167.82 (60.21-467.75)	20.24 (3.79-108.18)	12.81 (5.58-29.46)
REGICOR scale moderate-high	31.68 (18.62-53.70)	3.02 (1.23-7.38)	7.65 (4.50-13.01)
Fatty liver index high risk	2.12 (1.48-3.05)	3.59 (2.24-5.76)	1.32 (1.03-1.68)
Hepatic steatosis index high risk	2.29 (1.10-4.79)	2.13 (1.32-3.42)	ns
ZJU index high	ns	1.72 (1.03-2.87)	ns
Fatty liver disease index high	ns	2.24 (1.40-3.56)	ns

In the multivariate analysis using binary logistic regression, age 50 years and older, tobacco use were established as covariates. Age over 50 years and male gender are the variables that most increase the risk of presenting high values of the scales related to cardiovascular risk, while smoking only increases the risk of obesity according to BMI, the risk with the REGICOR and SCORE scales and the risk of non-alcoholic fatty liver disease with the FLI. (See **table IV**)

Discussion

The most salient data obtained in our study are a high prevalence of smoking (30.8% in men and 33.2% in women), a prevalence of obesity determined by BMI of 14.6% in women and 19.2% in men. Hypertension was found in 27.6% of the men and 6.8% of the women, while only 3.4% of the women and 12.9% of the men had metabolic syndrome. Finally, 10.3% of the men had moderate or high risk levels according to the REGICOR model, the percentage in women being 4.7%.

We have not found any studies in the different databases consulted that analyze cardiovascular risk in the group of computer workers, so we decided to compare our results with those obtained in different studies that assessed cardiovascular risk in office workers, as both groups have a sedentary job and preferably use a computer for their work.

A study of 100 Pakistani office workers49 (89% of them male) showed that the prevalence of smoking in this group (19%) was much lower than that found in our work, while another study in the same country of 515 civil servants50 (98% male) found a somewhat higher prevalence than ours (33.2%).

This same Pakistan study[50] also assessed the prevalence of excess weight, observing that 7.4% of the workers were obese (a much lower figure than ours), in contrast to the figures obtained in 235 Nigerian office workers[51] (90% male) where the prevalence of obesity was 34.5%, although the average age was also higher than ours (43.3 years).

Two studies assessed the percentage of office workers with high blood pressure, and in both cases the prevalence found was lower than ours, in the first study 17.7% of 90 Iranian workers[52] were hypertensive, while in the second study in Pakistan[50] the figure was somewhat higher (21.9%).

Metabolic syndrome using the IDF criteria in office workers was studied in 46 German male workers[53] with an average age of 45.8 years and found to have a very high prevalence of 33%, almost three times the figure found by us.

Three studies analyzed cardiovascular risk in office workers using the Framingham model, the first of which was conducted in 180 Iranian workers[54] of whom 70% were men, 9.5% had moderate or high risk levels. Slightly higher figures were obtained in Nigerian workers[51] (16.5%

moderate and 5.5% high risk). The German study[53] mentioned above reported a prevalence of high risk of 10.7%. The values obtained in these three studies are higher than those obtained by us.

A study carried out on 249 women and 390 men working in offices in Vizcaya[55] found that 6% of the women and 23.9% of the men had high values of atherogenic indices, figures similar to ours in women but much higher in men.

Among the strong points of our study we can highlight that it is the first to analyze parameters and scales related to cardiovascular risk in computer workers, it is also important to point out that the sample size is large, almost 2,000 workers, and the number of scales included is also very high. As limitations we would point out that the level of physical activity and diet, which are factors that can influence cardiovascular risk, have not been taken into account, as this information was not available.

We believe that it could be interesting to carry out studies similar to ours in other countries on a group such as IT workers, whose presence in companies is increasing.

Interests conflict

The researchers declare that they have no conflict of interest.

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