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Determination of cardiovascular risk level in spanish telephone operators: associated variables

Determinación del nivel de riesgo cardiovascular en teleoperadores españoles: variables asociadas

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Abstract

Introduction. Cardiovascular pathologies are the first cause of morbidity in Spain. The risk factors that influence their appearance and evolution include socioeconomic and labor aspects. The objective was to determine the level of cardiovascular risk in telephone operators. **Material and methods**. Retrospective and cross-sectional study in 1215 Spanish teleoperators in the period January 2017 and December 2017 in which different parameters related to cardiovascular risk are valued (overweight-obesity scales, cardiovascular risk scales, atherogenic indices, fatty liver risk scales and metabolic syndrome among others) and the influence on them of variables such as age, sex and tobacco use. The study was approved by the Clinical Research Ethics Committee of the Balearic Islands Health Area. **Results**. We highlight the high prevalence of high blood pressure in males (23.94%) obesity with BMI (20%), Hypercholesterolemia (27.89%) and high risk of fatty liver (23.36%). Age is the variable that shows the greatest influence on the cardiovascular risk factors analyzed. **Conclusions**. Although the average age of the sample is low (35.26 years in women and 33.61 years in men) a high prevalence of hypertension, obesity with different models, metabolic syndrome, moderate and high score and REGICOR values as well as high risk of fatty liver especially in men is observed.

Keyword: cardiovascular disease, risk factors, obesity, metabolic syndrome.

Resumen

Introducción. Las patologías cardiovasculares son la primera causa de morbimortalidad en España. Entre los factores de riesgo que influyen en su aparición y evolución se incluyen aspectos socioeconómicos y laborales. El objetivo fue determinar el nivel de riesgo cardiovascular en el colectivo de teleoperadores telefónicos. **Material y métodos**. Estudio retrospectivo y transversal en 1215 teleoperadores españoles en el periodo enero de 2017 y diciembre de 2017 en el que se valoran diferentes parámetros relacionados con el riesgo cardiovascular (escalas de sobrepeso-obesidad, escalas de riesgo cardiovascular, índices aterogénicos, escalas de riesgo de hígado graso y síndrome metabólico entre otros) y la influencia en ellos de variables como edad, sexo y consumo de tabaco. El estudio fue aprobado por el Comité de ética de investigación clínica del área de salud de Illes Balears. **Resultados**. Destacamos la alta prevalencia en varones de hipertensión arterial (23,94%) obesidad con IMC (20%), hipercolesterolemia (27,89%) y alto riesgo de hígado graso (23,36%). La edad es la variable que muestra mayor influencia en los factores de riesgo cardiovascular analizados. **Conclusiones**. Aunque la edad media de la muestra es baja (35,26 años en mujeres y 33,61 años en hombres) se observa una alta prevalencia de hipertensión, obesidad con los diferentes modelos, síndrome metabólico, valores moderados y altos de SCORE y REGICOR así como de alto riesgo de hígado graso especialmente en los hombres.

Palabras clave: enfermedades cardiovasculares, factores de riesgo, obesidad, síndrome metabólico.

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Introduction

Cardiovascular diseases are the leading cause of morbidity and mortality in Spain and are one of the main reasons for consultation in primary care (1).

With regard to the risk factors associated with them, there is a multifactorial epidemiological pattern that is found in most cases and among which we can highlight tobacco use, arterial hypertension, high cholesterol levels, diabetes and obesity, among others. There are also other possible risk factors such as socioeconomic, environmental and occupational conditions (2,3).

These diseases are an important public health problem, which makes it necessary to establish strategies aimed at reducing their incidence. Interventions on modifiable risk factors are a primary prevention strategy for which there is ample scientific, epidemiological and clinical evidence supporting its effectiveness (1).

The aim of this study was to determine the level of cardiovascular risk in telephone operators, analyzing their risk factors and their impact on cardiovascular risk.

Material and methods

A retrospective, cross-sectional study was conducted on 1312 Spanish telemarketers in the period January 2017 and December 2017. Of these 97 were excluded (86 for not agreeing to participate and 11 for not meeting the age requirement) leaving 1215 workers, of whom 860 were women (mean age 35.26 years) and 355 men (mean age 33.61 years). The workers were selected from among

those who attended periodic occupational medical check-ups.

Inclusion criteria

- Age between 18 and 67 years.
- Acceptance to participate in the study and use of the data for epidemiological purposes.

The anthropometric measurements of height and weight, clinical and analytical, were performed by the health personnel of the occupational health units after homogenizing the measurement techniques.

Weight and height were determined using a SECA 700 scale with an attached SECA 220 telescopic measuring rod. Abdominal waist circumference was measured using a SECA model 200 tape measure. For the waist / height ratio, a cut-off point was established from 0.50 (4).

Blood pressure was measured in the supine position with a calibrated OMRON M3 automatic sphygmomanometer and after 10 minutes of rest. Three measurements were taken at one-minute intervals and the mean of the three was obtained. Hypertension was considered hypertension when the values exceeded 140 mmHg systolic or 90 mmHg diastolic pressure or if the person was under antihypertensive treatment (5).

The analytical parameters were obtained by peripheral venipuncture after a 12-hour fast. Automated enzymatic methods were used for glycemia, total cholesterol and triglycerides. Values were expressed in mg/dL. HDL was determined by precipitation with dextran sulfate Cl2Mg, and values were expressed in mg/dL. LDL was calculated using the Friedewald formula (provided that triglycerides were less than 400 mg/dL). Values were expressed in mg/dL.

Friedewald formula: LDL= total cholesterol –HDL– triglycerides /5

The cut-off points for considering them altered were: 200 mg/dl for cholesterol, 130 mg/dl for LDL, 150 mg/dl for triglycerides. In the previous cases also if they are under treatment for any of these analytical alterations (6).

Blood glucose levels were classified according to the recommendations of the American Diabetes Association (7), with diabetes being considered as from 126 mg/dL or if they were receiving hypoglycemic treatment.

BMI was calculated by dividing weight by height in meters squared. The CUN BAE formula (8) (Clínica Universidad de Navarra Body Adiposity Estimator) was used to estimate the percentage of body fat, with cut-off points for obesity of 25% in men and 35% in women. Where man was equal to 0 and woman equal to 1.

-44,988 + (0,503 x edad) + (10,689 x sexo) + (3,172 x IMC) – (0,026 x IMC^2) + (0,181 x IMC x sexo) – (0,02 x IMC x edad) – (0,005 x IMC^{2}x sexo) + (0,00021 x IMC2 x edad)

To calculate the Visceral adiposity index (VAI) (9) the following formula was used:

$$\text{Females}: \ VAI = \left(\frac{WC}{36.58 + (1.89 \times BMI)}\right) \times \left(\frac{TG}{0.81}\right) \times \left(\frac{1.52}{HDL}\right).$$

$$\text{Males}: VAI = \left(\frac{WC}{39.68 + (1.88 \times BMI)}\right) \times \left(\frac{TG}{1.03}\right) \times \left(\frac{1.31}{HDL}\right)$$

To calculate the Body roudness index (BRI) (10) the following formula was used:

$$BRI = 364.2\text{-}365.5x\sqrt{1\text{-}[(waist/(2\pi)2)/(0.5 \ x \ height)2]}$$

Cardiometabolic index (11) was obtained by multiplying the waist-to-height ratio by the triglyceride atherogenic index/HDL-c.

Waist triglyceride index (12) = waist circumference in cm times triglycerides in mmol.

Triglyceride-Glucose index (13) = LN (Triglycerides [mg/dl] × glycemia [mg/dl]/2).

Lipid accumulation product (LAP) (14) was calculated:

- .In men: (waist circumference (cm) - 65) x (triglyceride concentration (mMol))
- In women: (waist circumference (cm) - 58) x (triglyceride concentration (mMol))

Fatty liver index (15). High risk was considered to be 60 or more.

Metabolic syndrome was determined with three models:

a) NCEP ATP III (National Cholesterol Educational Program Adult Treatment Panel III). Three or more of the following factors are required: waist greater than 88 cm in women and 102 in men, triglycerides greater than 150 mg/dL or specific treatment of this lipid disorder, blood pressure greater than 130/85 mm Hg, HDL less than 40 mg/dL in women or less than 50 in men or specific treatment, and fasting blood glucose greater than 100 mg/dL or specific treatment of blood glucose.

b) International Diabetes Federation (IDF) (16) The presence of central obesity (waist circumference over 80 cm in women and 94 cm

in men) is required, in addition to two of the other factors mentioned above for ATP III (triglycerides, HDL, blood pressure and glycemia).

c) JIS model (17) uses the same criteria as NCEP ATPIII but with waist cut-off points starting at 80 cm in women and 94 cm in men.

Hyper triglyceridemic waist (18) requires: waist circumference greater than 94 cm (men) and greater than 80 cm (women) and triglycerides greater than 150 mg/dl or treatment of hypertriglyceridemia.

The different atherogenic indexes have different cut-off points (19):

Total cholesterol/HDL-c index: low risk: < 5 in men and < 4.5 in women, moderate risk: between 5 and 9 in men and between 4.5 and 7 in women, and high risk: > 9 in men and > 7 in women. LDL-c/HDL-c ratio: low risk: < 3 and high risk ≥ 3. Triglycerides/HDL-c ratio was considered high risk as from 3%. Cholesterol-HDL-c index: high risk as from 130.

REGICOR (Registro Gironí del Cor) is an adaptation of the Framingham scale to the Spanish population (20). The scale has been validated in the Spanish population (21). It estimates the risk of suffering a fatal or non-fatal cerebrovascular event over a 10-year period. The tables are applied between 35 and 74 years of age. It was considered moderate from 5%, high from 10% and very high from 15% (22).

The SCORE (Systematic Coronary Risk Evaluation) scale used is the one recommended for Spain (23). It estimates the risk of suffering a fatal cerebrovascular event over a 10-year period. It is applied to persons between 40 and 65 years of age. It was considered moderate between 4-5% and high after 5% (24).

Vascular age with the SCORE model was calculated using tables (25). An interesting concept is avoidable lost life years (ALLY) (26) which can be defined as the difference between vascular age and biological age.

A person was considered to be a smoker if he/she 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 a year ago.

Statistical analysis

A descriptive analysis of the categorical variables was performed, calculating the frequency and distribution of responses for each variable. For quantitative variables, the mean and standard deviation were calculated and for qualitative variables the percentage was calculated. The bivariate analysis of association was performed using the 2 test (with correction for Fisher's exact statistic when conditions required it) and Student's t test for independent samples. For the multivariate analysis, binary logistic regression was used with the Wald method, with 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, the accepted level of statistical significance being 0.05.

Ethical considerations and aspects

The research was approved by the Clinical Research Ethics Committee of the Illes Balears health area, no. IB 4383/20. All procedures were performed in accordance with 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 research.

Results

The mean values by sex of the different anthropometric, clinical and analytical variables of the sample are presented in Table 1. The high percentage of smokers in both sexes stands out. In all the variables the results were worse in men except for cholesterol.

The mean values of the scales related to cardiovascular risk were always more unfavorable in men. The complete data are presented in Table 2.

The results shown in Table 3 indicate that, despite the low mean age of the sample, there is a high prevalence of hypertension, obesity with the different models, metabolic syndrome, moderate and high SCORE and REGICOR values, and fatty liver disease (FLI), especially in men.

Multivariate analysis by logistic regression showed that age was the variable with the greatest influence on the cardiovascular risk factors analyzed, with odds ratios ranging from 1.59 (95% CI 1.21-2.08) for high waist/height and 132.22 (95% CI 19.75-885.23) for high SCORE. Smoking showed very little influence, affecting only cardiovascular risk scales such as SCORE and REGICOR (Table 4).

Discussion

This study shows the variables related to cardiovascular risk in a very specific type of worker, teleoperators. The data obtained indicate a higher prevalence of cardiovascular risk values than expected in a group of young people (33-35 years of age). There are no specific studies in the scientific literature on this subject and for this group of workers. The published works show references to the repercussion of teleworking on aspects linked to psychosocial risks, job satisfaction and well-being, leaving open the option of considering other risk factors for health and concluding that

Table 1. Sample characteristics

	Female n=860	Male n= 355	
	Mean (DE)	Mean (DE)	p
Age (years)	35,26 (8,96)	33,61 (9,78)	0,004
Height (cm)	163,00 (6,42)	176,90 (6,95)	<0,0001
Peso (kg)	68,42 (17,89)	81,72 (17,58)	<0,0001
Waist (cm)	75,64 (14,66)	85,53 (14,92)	<0,0001
TAS (mmHg)	118,84 (14,51)	128,83 (13,19)	<0,0001
TAD (mmHg)	74,06 (10,55)	76,94 (10,22)	<0,0001
Cholesterol (mg/dl)	186,31 (34,08)	180,14 (38,07)	0,006
HDL (mg/dl)	57,74 (7,42)	52,41 (7,51)	<0,0001
LDL (mg/dl)	110,00 (32,53)	103,77 (35,22)	0,003
Triglycerides (mg/dl)	93,12 (48,40)	122,83 (89,50)	<0,0001
Glucose (mg/dl)	87,11 (12,90)	91,74 (13,36)	<0,0001
ALT (U/l)	17,65 (9,95)	27,42 (17,88)	<0,0001
AST (U/l)	16,41 (3,66)	38,09 (15,01)	<0,0001
GGT (U/l)	19,70 (15,11)	29,46 (20,87)	<0,0001
	%	%	
< 30 years	29,42	37,46	0,001
30-39 years	43,02	35,77	
40-49 years	20,93	18,59	
? 50 years	6,63	8,18	
smokers	35,00	34,08	0,761
non-smokers	65,00	65,92	

Table 2. Mean values for cardiovascular risk indicators by sex

	Female n=860	Male n= 355	
	Mean (DE)	Mean (DE)	p
Waist/height	0,46 (0,09)	0,48 (0,08)	<0,0001
BMI	25,71 (6,37)	26,06 (5,10)	0,362
CUN BAE	34,91 (7,99)	23,58 (7,72)	<0,0001
Body roundness index	2,84 (1,69)	3,15 (1,50)	<0,0001
Visceral adiposity index	2,77 (1,68)	7,03 (6,60)	<0,0001
ALLY vascular age	3,96 (5,15)	6,92 (6,50)	<0,0001
SCORE scale	0,30 (0,85)	1,41 (2,20)	<0,0001
REGICOR scale	1,74 (1,48)	2,84 (1,77)	<0,0001
Fatty liver index	20,59 (26,43)	34,56 (30,09)	<0,0001
Lipid accumulation product	20,49 (26,02)	31,53 (37,66)	<0,0001
Cholesterol /HDL	3,29 (0,79)	3,54 (1,07)	<0,0001
Triglycerides /HDL	1,67 (0,98)	2,47 (2,09)	<0,0001
LDL/HDL	1,96 (0,70)	2,06 (0,88)	0,037
Cholesterol-HDL	128,56 (35,61)	127,74 (40,26)	0,724
Cardiometabolic index	0,80 (0,59)	1,24 (1,15)	<0,0001
Triglyceride-glucose index	8,20 (0,48)	8,45 (0,60)	<0,0001
Waist triglyceride index	81,52 (52,96)	121,75 (97,22)	<0,0001

Table 3. Prevalence of altered cardiovascular risk indicators by sex

	Female n=860	Male n= 355	
	Mean (DE)	Mean (DE)	p
Arterial hypertension	12,44	23,94	<0,0001
Cholesterol ? 200 mg/dl	31,28	27,89	0,242
LDL ? 130 mg/dl	25,81	23,10	0,320
Triglycerides ? 150 mg/dl	9,42	23,10	<0,0001
Glycemia ? 126 mg/dl	1,51	2,25	<0,0001
Waist/height > 0,50	24,07	33,52	0,001
Obesity BMI	18,14	20,00	0,039
Obesity CUN BAE	43,6	38,31	0,164
Metabolic syndrome ATPIII	10,00	13,24	0,100
Metabolic syndrome IDF	9,65	12,68	0,118
Metabolic syndrome ATP JIS	10,58	22,82	<0,0001
Hyper triglyceridemic waist	2,33	8,17	<0,0001
Cholesterol/HDL moderate-high	7,56	8,17	0,742
Triglycerides /HDL high	7,33	22,82	<0,0001
LDL/HDL high	8,60	14,08	0,001
Cholesterol-HDL	44,53	43,94	0,850
SCORE moderate-high	3,78	16,84	<0,0001
REGICOR moderate-high	5,61	14,38	<0,0001
High Fatty liver index	11,51	23,36	<0,0001

Table 4. Binary logistic regression to assess the influence of age, sex and smoking on different variables related to cardiovascular risk

	Age ? 50 years			Male			Smoker		
	OR	IC 95%	p	OR	IC 95%	p	OR	IC 95%	p
Arterial hypertension	3,65	2,30-5,80	<0,0001	2,22	1,61-3,06	<0,0001			ns
Cholesterol ? 200 mg/dl	3,71	2,38-5,78	<0,0001			ns			ns
LDL ? 130 mg/dl	3,88	2,50-3,03	<0,0001			ns			ns
Triglycerides ? 150 mg/dl	2,30	1,36-3,90	0,002	2,88	2,05-4,04	<0,0001			ns
Glycemia ? 126 mg/dl	10,59	4,33-25,88	<0,0001			ns			ns
Waist/height > 0,50	1,59	1,21-2,08	0,001			ns			ns
Obesity BMI			ns			ns			ns
Obesity CUN BAE	3,40	2,13-5,43	<0,0001			ns			ns
Metabolic syndrome ATPIII	4,00	2,43-6,59	<0,0001			ns			ns
Metabolic syndrome IDF	2,01	1,13-3,58	0,017			ns			ns
Metabolic syndrome ATP JIS	3,39	2,08-5,52	<0,0001	2,5	1,79-3,49	<0,0001			ns
Hyper triglyceridemic waist	3,01	1,39-6,51	0,005	3,7	2,06-6,64	<0,0001			ns
Cholesterol/HDL moderate-high	6,09	3,61-10,27	<0,0001			ns			ns
Triglycerides /HDL high	2,18	1,25-3,82	0,006	3,73	2,61-5,34	<0,0001			ns
LDL/HDL high	4,66	2,82-7,70	<0,0001	1,72	1,17-2,55	0,006			ns
Cholesterol-HDL	4,15	2,52-6,82	<0,0001			ns			ns
SCORE moderate-high	132,22	19,75-885,23	<0,0001	20,06	4,22-95,31	<0,0001	21,52	4,44-104,20	<0,0001
REGICOR moderate-high	14,82	7,38-29,73	<0,0001	2,99	1,48-6,02	0,002	4,12	2,03-8,33	<0,0001
High Fatty liver index	1,81	1,05-3,09	0,032	2,34	1,69-3,25	<0,0001			ns

multidimensional support is needed to prevent mental and physical illnesses and disorders (27).

The studies carried out, although scarce, are focused on telework and related to their usual occupational health risk management practices and indicate that they should be improved by adjusting some of the components of the management system, adapting them to technological innovations and applying them to the organizational and planning components in the company (28).

The results provided by our work may open up lines of research into cardiovascular risk in the group of teleworkers and teleworkers, whose growing tendency has become evident in the current COVID-19 pandemic, and which may provide data of preventive interest.

The strength of this study is that it provides results in a little-studied group and with a sample size that allows us to obtain significant conclusions, especially when it includes a large number of cardiovascular risk variables and scales: 5 scales to assess obesity, 3 to assess cardiovascular risk, 2 to assess the risk of fatty liver disease, 4 atherogenic indices, 5 cardiometabolic indicators, and 3 indicators related to cardiovascular risk; together with these, some less used variables such as sociodemographic variables that have been shown to be relevant in the results.

The limitations of the study are that it is limited to the work setting, which does not allow the results to be extrapolated to the general population, and that its geographical scope is Spanish, which may imply different results in countries with different living and working conditions.

Given the small number of publications in these groups, we hope that this study will guide further research in teleworkers and in other similar positions such as teleworkers whose common lifestyle is of preventive interest in cardiovascular risk.

Conclusions

Despite the low mean age of the sample (35.26 years in women and 33.61 years in men), this group of workers shows a high prevalence of cardiovascular risk factors such as hypertension or obesity with the different models, as well as a high presence of metabolic syndrome, moderate and high values of the SCORE and REGICOR scales, and a high risk of fatty liver disease. These high values are especially present in men.

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Authors' contribution

AALG: Research design, statistical analysis and revision of the manuscript.
MTVH: Collection and preparation of the database, writing the manuscript.
LMCG: Collection and preparation of the database, revision of the manuscript.
MRVIT: Collection and preparation of the database, writing the manuscript.
BRF: Literature review and revision of the manuscript.
NRF: Literature review and revision of the manuscript.

Conflict of interests

All authors declare no conflict of interest.

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