eISSN 2255-0569

ORIGINAL

Influence of sociodemographic variables and tobacco consumption on the prevalence of atherogenic dyslipidemia and lipid triad in 418.343 spanish workers

Influencia de variables sociodemográficas y consumo de tabaco en la prevalencia de dislipemia aterogénica y triada lipídica en 418343 trabajadores españoles

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Received: 11 - VII - 2023
Accepted: 15 - VIII - 2023

doi: 10.3306/AJHS.2023.38.06.84

Abstract

Introduction and objective: Atherosclerosis is influenced by many factors such as obesity, dyslipidemia, arterial hypertension, diabetes, sex or age. Atherogenic dyslipidemia (AD) and lipid triad (LT) are indicators of atherosclerosis. The aim of this study was to determine the influence of sociodemographic variables and tobacco consumption on the appearance of AD and LT.
Material and methods: Study carried out in 418343 Spanish workers with a mean age of 40.2 years in which sociodemographic variables such as age, sex and social class and their influence on the prevalence of AD and LT were assessed.
Results: The overall prevalence of AD was 6.19% (7.33% in men and 3.98% in women) and that of TL was 1.70% (2.9% in men and 1% in women). All the variables analyzed show their influence on the occurrence of AD and TL, especially age.
Conclusions: The prevalence of AD and TL is 6.19% and 1.70% respectively. Although all the variables influence the appearance of AD and TL, the one that shows the highest values is age.

Key words: Atherogenic dyslipidemia, lipid triad, sociodemographic variables, tobacco.

Resumen

Introducción y objetivo: La aterosclerosis se ve influenciada por muchos factores como pueden ser la obesidad, la dislipemia, la hipertensión arterial, la diabetes, el sexo o la edad. La dislipemia aterogénica (DA) y la triada lipídica (TL) son indicadores de aterosclerosis. El objetivo de este estudio es conocer la influencia de variables sociodemográfica y consumo de tabaco sobre la aparición de DA y TL.
Material y métodos: Estudio realizado en 418343 trabajadores españoles con una edad media de 40,2 años en el que se valoran variables sociodemográficas como la edad, sexo y clase social y su influencia sobre la prevalencia de DA y TL.
Resultados: La prevalencia global de DA es del 6,19% (7,33% en hombres y 3,98% en mujeres) y la de TL del 1,70% (2,9% en hombres y 1% en mujeres). Todas las variables analizadas muestran su influencia sobre la aparición de DA y TL especialmente la edad.
Conclusiones. La prevalencia de DA y TL es de 6,19% y 1,70% respectivamente. Aunque todas las variables influyen en la aparición de DA y TL la que muestra unos valores mayores es la edad.

Palabras clave: Dislipemia aterogénica, triada lipídica, variables sociodemográficas, tabaco.

Cite as: Ramírez-Manent JI, Tomás-Gil P , Coll-Villalonga JL , Marti-Lliteras P, López-González AA, Paublini H. Influence of sociodemographic variables and tobacco consumption on the prevalence of atherogenic dyslipidemia and lipid triad in 418.343 spanish workers. *Academic Journal of Health Sciences 2023*; 38 (6):84-9 doi: 10.3306/AJHS.2023.38.06.84

Introduction

Arteries are blood vessels that carry oxygen-rich blood to the heart and other parts of the body. Atherosclerosis occurs when the inner linings of these arteries fill with fat, cholesterol and other substances, forming a plaque that clogs them[1]. The artery wall becomes enlarged and loses elasticity when this plaque forms[2,3]. One problem with this disease is that it tends to develop very quickly. Large and medium-sized arteries are affected by atherosclerosis. As the body ages, it is common for arteries to harden[4]. This occurs because plaques build up and narrow the arteries, making them stiffer[5].

Clots can develop in these narrowed arteries and block blood flow, but fragments of plaque can also break off and reach other smaller vessels, impeding the passage of blood and oxygen[6,7].

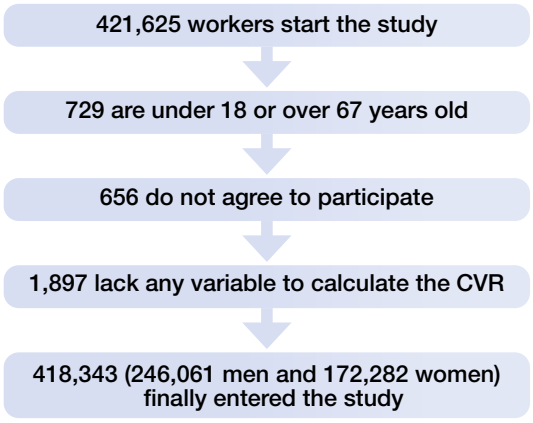
Some circumstances, such as smoking[8], hypertension[9], obesity[10], sedentary lifestyle[11], and a diet rich in saturated fats[12], can become risk factors and lead to the development of this disease, although the exact causes are not known.

It is known that the prevalence of some of these atherosclerotic risk factors[13,14,15] is influenced by different sociodemographic variables such as age, sex, socioeconomic level, and tobacco consumption, so the aim of this study is to assess the influence that these variables can have on the appearance of atherogenic dyslipidemia (AD) and lipid triad (LT) in a group of Spanish workers.

Material y métodos

Figure 1 shows the results of the flow chart showing the final number of workers to be included in the study once the inclusion criteria had been applied. Of the 421625 workers who started the study, 3282 were excluded because they did not meet the inclusion criteria, leaving 418.343 workers who finally started the study.

Figure 1: Flowchart of participants.



Inclusion criteria:

- Belonging to one of the companies participating in the study.
- To have an age range between 18 and 69 years.
- To accept to participate in the study and to yield the use of the data for its analysis.

Determination of variables

Atherogenic dyslipidemia was assessed by the combination of high triglyceride levels, low HDL cholesterol levels (less than 50 mg/dL in women and less than 40 mg/dL in men) and normal LDL cholesterol levels[16]. If LDL cholesterol also exceeded 160 mg/dL, a lipid triad was considered[17].

Age was stratified into 5 groups, namely 18 to 29 years, 30 to 39 years, 40 to 49 years, 50 to 59 years, and 60 to 69 years.

Sex was established dichotomously: male and female.

A smoker was considered a smoker if during the previous 30 days he or she had smoked one or more cigarettes a day, or the equivalent in another form of consumption, or if he or she had quit smoking in the previous 12 months.

The 2011 National Classification of Occupations (CNO-11) and the standards of the Spanish Society of Epidemiology18 were used to divide workers into three social groups. I. Leaders, university employees, athletes and creative II. Employees without the appropriate qualification.

Ethical aspects

The study complied with the ethical standards of the institutional research committee and the 2013 Declaration of Helsinki. Anonymity and confidentiality of the data collected could always be maintained. The study was approved with IB 4383/20 by the Research Ethics Committee of the Balearic Islands (CEI-IB). Only the person responsible for the study was able to decrypt the data to identify all employees in the study. The research team undertook to comply with the Organic Law 3/2018, of December 5, on the protection of personal data and guarantee of digital rights to ensure that all participants in this study could exercise their right of access, rectification, deletion and opposition to the use of their data for any purpose.

Statistical analysis

Mean and standard deviation were calculated for quantitative data with the t-student test. The prevalence of qualitative variables was calculated using the chi-square test. Multivariate analysis was performed using multinomial logistic regression. Statistical analysis was performed using SPSS 28.0 software. The cut-off value for statistical significance was accepted as p0.05.

Results

Of these 4,18,343 workers, 58.82% are male. The average age of the sample is around 40 years (slightly higher in men) and the majority group is in the range of 30 to 49 years. Most belong to the most disadvantaged social class (class III) and approximately one out of every three persons is a smoker.

All the parameters show more unfavorable values in men, the differences found being statistically significant as can be seen in **table I**.

Table II shows the prevalence of AD and LD according to the different sociodemographic variables (sex, age and social class) and tobacco use.

The prevalences of both variables are much higher in men and increase with age and as one descends in social class. Prevalences are also higher among smokers. In all cases the differences found are statistically significant.

The overall prevalence of AD is 6.19% while that of LD is 1.70%.

Table III shows the prevalence of AD and LD, both in women and men, according to age, social class and tobacco use.

We find a similar situation to that mentioned above, i.e., there is an increase in the prevalence of both AD and LD as age increases and as social class and smoking levels decrease. In all cases the prevalences are always higher

Table I: Characteristics of the population.

	Women n=172,282 Mean (SD)	Men n=246,061 Mean (SD)	Total n=418,343 Mean (SD)	p-value
Age (years)	39.6 (10.8)	40.6 (11.1)	40.2 (11.0)	<0.0001
Height (cm)	161.8 (6.5)	174.6 (7.0)	169.4 (9.3)	<0.0001
Weight (kg)	66.2 (14.0)	81.4 (14.7)	75.1 (16.2)	<0.0001
Waist circumference (cm)	74.8 (10.6)	86.2 (11.1)	81.5 (12.2)	<0.0001
SBP (mmHg)	117.4 (15.7)	128.2 (15.5)	123.7 (16.5)	<0.0001
DBP (mmHg)	72.6 (10.4)	77.8 (11.0)	75.6 (11.0)	<0.0001
Total colesterol (mg/dL)	190.6 (35.8)	192.6 (38.9)	191.8 (37.7)	<0.0001
HDL-c (mg/dL)	56.8 (8.7)	50.3 (8.5)	53.0 (9.1)	<0.0001
LDL-c (mg/dL)	116.1 (34.8)	118.0 (36.7)	117.2 (35.9)	<0.0001
Triglycerides (mg/dL)	89.1 (46.2)	123.7 (86.4)	109.5 (74.6)	<0.0001
Glycaemia	87.8 (15.1)	93.3 (21.3)	91.0 (19.2)	<0.0001
ALT (U/L)	20.2 (13.6)	31.0 (20.2)	26.6 (18.6)	<0.0001
AST (U/L)	18.2 (7.9)	24.4 (13.3)	21.7 (11.7)	<0.0001
GGT (U/L)	20.4 (19.7)	35.8 (39.3)	29.6 (33.6)	<0.0001
	%	%	%	p
18-29 years	20.7	18.8	19.6	
30-39 years	29.7	27.6	28.4	
40-49 years	29.6	30.1	29.9	
50-70 years	20.0	23.6	22.2	
Social class I	6.9	4.9	5.7	
Social class II	23.4	14.9	18.4	
Social class III	69.7	80.3	75.9	
Non-smokers	67.2	66.6	66.9	
Smokers	32.8	33.4	33.2	

SBP systolic blood pressure. DBP diastolic blood pressure. HDL-c high density lipoprotein-cholesterol. LDL-c low density lipoprotein-cholesterol. ALT aspartate transaminase. ALT alanine transaminase GGT gammaglutamyl transferase.

Table II: Influence of sociodemographic variables and smoking on the prevalence of atherogenic dyslipidemia and lipid triad.

		No DA	DA		NO TL	TL	
	n	%	%	p	%	%	p
Women	172282	96,02	3,98	<0.0001	99,00	1,00	<0.0001
Men	246061	92,27	7,73		97,81	2,19	
18-29 years	81832	98,4	1,6	<0.0001	99,77	0,23	<0.0001
30-39 years	118913	96,03	3,97		99,10	0,90	
40-49 years	124952	92,59	7,41		97,84	2,16	
50-59 years	77473	89,02	10,98		96,69	3,31	
60-69 years	15173	86,28	13,72		96,12	3,88	
Social class I	23844	95,27	4,73	<0.0001	98,61	1,39	<0.0001
Social class II	76856	94,39	5,61		98,51	1,49	
Social class III	317643	93,56	6,44		98,23	1,77	
Non-smokers	279647	93,92	6,08	<0.0001	98,40	1,60	<0.0001
Smokers	138696	93,59	6,41		98,11	1,89	
Global	418343	93,81	6,19		98,30	1,70	

DA Dislipemia aterogénica. TL Triada lipídica.

in men and the differences found are always statistically significant. The prevalence of AD is 7.73% in men and 3.98% in women, while that of LD is 2.19% in men and 1% in women.

Table IV shows the results of the multivariate analysis using multinomial logistic regression. The reference variables were female sex, age between 18 and 29 years, social class I and non-smokers. The variable that most increases the risk of presenting DA and TL is age, since the ORs reach 9.58 CI 8.91-10.29 for DA and 16.98 CI 95% 14.40-20.02 for TL). Other variables such as sex, social class and tobacco use also increase the risk.

Table III: Influence of sociodemographic variables and tobacco use on the prevalence of atherogenic dyslipidemia and lipid triad by sex.

	Women					Men				
	n	DA	p	TL	p	n	DA	p	TL	p
18-29 years	35617	1,28	<0.0001	0,18	<0.0001	46215	1,85	<0.0001	0,27	<0.0001
30-39 years	51115	2,45		0,40		67798	5,12		1,28	
40-49 years	51017	4,37		0,98		73935	9,51		2,97	
50-59 years	28951	8,03		2,68		48522	12,74		3,69	
60-69 years	5582	10,5		3,12		9591	15,57		4,33	
Social class I	11894	2,34	<0.0001	0,66	<0.0001	11950	7,11	<0.0001	2,12	<0.0001
Social class II	40266	3,64		0,92		36590	7,77		2,15	
Social class III	120122	4,25		1,05		197521	7,96		2,21	
Non-smokers	115727	3,95	<0.0001	0,99	<0.0001	163920	7,54	<0.0001	2,04	<0.0001
Smokers	56555	4,01		1,10		82141	8,11		2,50	
Global	172282	3,98		1,00		246061	7,73		2,19	

DA Dislipemia aterogénica. TL Triada lipídica.

Table IV: Multinomial logistic regression.

	DA		TL	
	OR (IC 95%)	p	OR (IC 95%)	p
Woman	1	<0.0001	1	<0.0001
Man	1,92 (1,87-1,98)		2,08 (1,97-2,20)	
18-29 years	1	<0.0001	1	<0.0001
30-39 years	1,29 (1,23-1,36)		1,18 (1,08-1,29)	
40-49 years	1,94 (1,85-2,04)		1,79 (1,63-1,96)	
50-59 years	3,73 (3,53-3,94)		4,29 (3,88-4,75)	
60-69 years	9,58 (8,91-10,29)		16,98 (14,40-20,02)	
Social class I	1	<0.0001	1	<0.0001
Social class II	1,10 (1,07-1,14)		1,13 (1,06-1,21)	
Social class III	1,30 (1,23-1,39)		1,19 (1,07-0,34)	
Non-smokers	1	<0.0001	1	<0.0001
Smokers	1,08 (1,05-1,11)		1,21 (1,16-1,27)	

DA Dislipemia aterogénica. TL Triada lipídica. OR Odds ratio

Discussion

All the variables analyzed showed an influence on the appearance of both AD and TL, the most influential being, in order, advanced age, male sex, belonging to the most disadvantaged social classes, and being a smoker. The overall prevalence of AD is 6.19% and that of LD is 1.70%.

An observational, cross-sectional study of 70,609 Spanish workers[19] (71.5% men, 28.5% women) with a mean age of 39.2 years (similar to ours) showed that sex, older age and tobacco use increased the risk of presenting AD and TL as we have seen. The impact of social class was not evaluated in this study.

A Chinese study carried out on more than 22,000 people[20] concluded that both age and male sex were factors that were independently related to the appearance of AD. Another study carried out in the same country on a large sample of more than 39,000 people[21] expressed the same opinion. Another Ethiopian study[22] conducted in almost 400 people of both sexes also concluded that older age was an independent risk factor for increased AD.

Another Chinese study carried out in almost 137000 people[23] gave different data to those found by us, as the prevalence of AD was higher in women (OR 1.83 CI 95% 1.75-1.91) and also found no differences

between people from rural and urban areas although their socioeconomic level was not specified. The higher prevalence of AD in women was also reported in another study conducted in China[24].

The results of the GALIPEMIAS study[25] conducted in the adult population of Galicia showed an overall prevalence of AD of 6.6%, somewhat higher than that obtained by us. In the ICARIA study[19] also carried out in the Spanish population, the overall prevalence of AD was 5.7% while that of TL was 1.1%, data more similar to those found in our study. Another multicenter study carried out in 14 autonomous communities in Spain[26] with 1828 participants aged 18 years and older showed a prevalence of 17.9%, much higher than ours.

Strengths and limitations

The main strength of this study is that it has been carried out in a very large sample (more than 418000 workers), which gives great strength and power to the results obtained. Another strength is that it is one of the first studies to assess the influence of socioeconomic level, represented by social class, on the appearance of both AD and TL, so that it can become a reference study for subsequent research by other authors.

The main limitation of the study is that atherosclerosis is not determined objectively using imaging techniques but by means of risk scales. Another limitation is that the study was carried out in a working population (between 18 and 69 years of age) so that the results could not be extrapolated to the general population.

Conclusions

All the variables analyzed, and especially age, will influence the appearance of AD and LBP in our sample.

The overall prevalence of AD is 6.19% (7.73% in men and 3.98% in women) while that of TL is 1.70% (2.19% in men and 1% in women).

Conflict of Interest

The authors declare that there is no conflict of interest.

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