PREDICTIVE ANALYSIS OF CARDIOVASCULAR RISK AMONG UNIVERSITY PROFESSIONALS

Abstract

Background: Cardiovascular diseases (CVD) have become the primary cause of morbidity and mortality worldwide. The aim of this study was to examine the differential cardiovascular risk profile among university professionals.

Methods: A cross-sectional study was conducted on a sample of 1,483 workers from a public university in Madrid. Sociodemographic variables, lifestyle factors, and cardiovascular risk factors were collected. Cardiovascular morbidity and mortality risk were calculated using the SCORE2 system. The workers were classified according to their professional category (faculty vs administrative personnel), sex or type of contract (government employees vs non-government employees). Multinomial logistic regression was conducted with the variables professional category, physical activity (PA) and SCORE2.

Findings: The calculated risk of cardiovascular morbidity and mortality was lower in women than in men (3.00 ± 1.91 vs 4.06 ± 2.26; p < 0.001), higher in the administrative personnel than in the faculty (3.82 ± 2.10 vs 3.20 ±2.18; p < 0.001), and lower in the non-government employees compared to the government employees (3.21 ± 2.05 vs 3.83 ± 2.22; p < 0.001). The group that engaged in less PA was the administrative personnel non-government employees. The regression model results corroborate the hypothesis that administrative personnel government employees and non-government employees as well as faculty non-government employees, are at a higher risk of physical inactivity than faculty government employees. Furthermore, the data indicates that administrative personnel government employees are at an elevated cardiovascular risk.

Conclusion/ Applications to Practice. It is essential to consider the professional category and the type of contract to assess cardiovascular risk in university workers. It is

recommended that strategies be implemented to promote PA among university professionals.

Keywords. Cardiovascular risk; administrative personnel; faculty; government employees; non-government employees

Background

The principal cardiovascular risk factors are cholesterol and low-density lipoproteins (LDL-C), high blood pressure, obesity, diabetes, and smoking. Other non-modifiable risk factors include age and sex. The most effective form of prevention is the promotion of a healthy lifestyle, with an emphasis on PA and smoking cessation (Nedkoff et al., 2023; Teo & Rafiq, 2021).

To estimate cardiovascular risk, the ESC devised the "Systematic Coronary Risk Estimation" (SCORE) index, which is a global cardiovascular risk index that has been calibrated and validated by the ESC (Conroy et al., 2003; Mostaza et al., 2019). This index has been updated, and the SCORE2 is now used for the population between the ages of 40 and 69. For individuals over the age of 70, the "Systematic Coronary Risk Estimation 2-Older Person" (SCORE2-OP) is employed. The SCORE2 is a prediction model that is used to calculate the risk of developing CVD and dying from it within a ten-year period in individuals who have not previously been diagnosed with CVD or diabetes (Visseren et al., 2021).

It is imperative that the risk factors and primary prevention of these diseases be studied to reduce the cardiovascular morbidity and mortality associated with them.

Regarding university employees, the most prevalent risk factors identified above with respect to the general population are attributable to their occupational circumstances. These include sedentary work practices, occupational stress, and the availability of nutritionally unbalanced food in university canteens and cafeterias (Balcázar-Rueda et al., 2017). Several studies conducted among university professors at public universities have already demonstrated that this cohort exhibits elevated levels of cardiovascular risk (Costa Moreira et al., 2014; Sandoval Jaramillo et al., 2021). It is important to note that the search of the literature revealed a paucity of studies on cardiovascular risk in the university working population (Yaguachi Alarcón et al., 2024). Furthermore, the studies that were identified were often more than five years old, the sample size was limited, and the indices utilized

were not as robust as the SCORE2. Moreover, the existing literature has not addressed the potential differences between workers based on their professional category or type of contract (Lozano-Casanova et al., 2023). Accordingly, the objective of this study was to calculate and analyze the differential cardiovascular risk profile between faculty and administrative personnel in a public university, considering the influence of PA.

Methods

Design

This is a cross-sectional observational descriptive study conducted with data from workers at a public university in Madrid, Spain.

Sample size

A convenience sampling method was employed, obtaining data from workers who attended health check-ups provided by the university's occupational health service during 2023 (3397 employees). Cases with ages between 40 and 69 years (the age range for SCORE2) and without missing values in the variables comprising SCORE2 (essential for its calculation) were selected. The final sample consisted of 1,483 workers (705 corresponding to teaching and research staff and 778 to administrative and service staff).

Considering that in Spanish public universities there were 93,697 workers with the professional category of faculty, between 40 and 69 years old, during the 2022-2023 academic year (latest available data) (Ministry of Science, Innovation and Universities, 2024), and that the estimated proportion in Spain for CVD is 26% (Instituto Nacional de Estadística, 2024), the achieved sample size (705) corresponds to a sampling error of 3.22% (95% CI).

In the case of administrative personnel (778), under the same conditions, 49,790 individuals were counted, which represented a sampling error of 3.06% (95% CI). These two

percentages are in close alignment with the minimum recommended percentage, which falls between 3 and 5% (Araujo, 2010).

Variables and measurement instruments

Quantitative variables, including age, maximum blood pressure, total cholesterol, and HDL cholesterol, were categorized according to the SCORE2 classification (Visseren et al., 2021). The levels and groupings of all variables are described below:

1. Sociodemographic: sex (male, female); age (40 to 49, 50 to 59, 60 to 69).
2. Habits: smoking (yes, no); alcohol consumption (does not drink, daily, weekends, sporadic and ex-drinker); PA (does not perform and number of days per week).
3. Clinical: systolic blood pressure (100 to 119, 120 to 139, 140 to 159, and 160 to 179); total cholesterol in mg/dL (<150, 150 to 199, 200 to 249); HDL cholesterol in mg/dl (<40, 40 to 59, >=60); non-HDL cholesterol in mmol/l (3 to 3.9, 4 to 4.9, 5 to 5.9, and 6 to 6.9);
4. Employment: professional category (faculty or administrative personnel), type of contract (government employees or non-government employees) and years of professional experience (quantitative variable).

The variables sex, age, systolic blood pressure, smoking status, and non-HDL cholesterol were employed to calculate the SCORE2, which classifies the risk of cardiovascular morbidity and mortality as follows: low risk (less than 2.5%), moderate risk (2.5 to 5%), high risk (5.1 to 7.5%), and very high risk (>7.6%) (Visseren et al., 2021).

Statistical analysis

The qualitative variables were summarized using frequencies and percentages. In examining the univariate analysis of categorical variables, the Chi-squared or Fisher's exact test was employed. To assess the normality of the quantitative variables, the Kolmogorov-Smirnov test was employed. Between dichotomous and quantitative variables, the Mann-

Whitney U test was utilized due to the non-normality of the sample or the Welch t-test in instances of non-normality and violation of the assumption of homogeneity of variances (Johnson & Kuby, 2019) . A multinomial logistic regression model, including an interaction analysis between the explanatory variables, was used in the multifactorial analysis to investigate the relationship between the variable of interest (professional category) and the explanatory variables (physical activity and SCORE2). To enhance the statistical power of the analysis, the categories of the PA variable were consolidated into four distinct groups: no activity, 1 to 2 days per week, 3 to 5 days per week, and 6 to 7 days per week. Faculty government employees were taken as references, with a SCORE2 of less than 2.5% and no reported PA. All assumptions were met in all statistical tests.

The cardiovascular risk adapted to the Spanish population was calculated in accordance with SCORE2 methodology. The values were subsequently categorized according to the aforementioned methodology, and two heat maps were constructed, one for each of the categories of professional category and type of contract. The variables PA and alcohol consumption exhibited missing values, representing less than 1.7% of the total data set. However, no imputations or analyses were conducted due to the minimal impact these missing values had on the overall results. The data were analyzed using the statistical software packages SPSS version 26 (IBM Corp., 2019) and Jamovi version 2.4.11 (The Jamovi Project, 2023).

Results

Of the 1,483 workers, 50.2% (*n* = 745) were women. The mean age of all workers was 53.7 ± 7.04 years.

Sex-specific differences in cardiovascular profile

The present study examined the differences in cardiovascular profile and sociodemographic variables between men and women, irrespective of professional category or type of contract (Table 1). Regarding age, it was noted that there was a greater proportion

of women than men in the 40 - 49 age group (36.0% vs. 25.4%; p < 0.001). The government employees category exhibited a notable disparity, with a higher proportion of men (59.5%) than women (44.0%) (p < 0.001). Conversely, the faculty category demonstrated a greater representation of women (54.9%) compared to men (59.9%) (p < 0.001). With regard to cardiovascular risk variables, women exhibited a lower prevalence of smoking (32.9% vs 38.6%; p = 0.021) and a higher proportion of systolic blood pressure ≥140 mmHg (15.2% vs 9.7%; p < 0.001) compared to men. Additionally, a higher proportion of women consumed alcohol daily (14.7% vs 6.7%; p < 0.001). The total cholesterol levels were observed to be lower in women compared to men (203±26.1 vs 215±26.4; p < 0.001). However, no differences were identified between the groups regarding high cholesterol risk levels above 200 mg/dL (2.8% vs 3.0%; p = 0.93). The mean HDL cholesterol level was lower in women (54.7±10.8 mg/dL) than in men (67.1±13.3 mg/dL; p < 0.001). Men exhibited a higher frequency of levels ≥60 mg/dL. No statistically significant differences were observed in LDL cholesterol and non-HDL cholesterol levels. Furthermore, women exhibited elevated blood glucose levels (90.8±12 vs 87.8 vs 15.4; p < 0.001) and higher BMI (26.8±3.93 vs 25.4±4.22; p < 0.001) compared to men. The calculated risk of cardiovascular morbidity and mortality using the SCORE2 was found to be lower in women than in men (3.00±1.91 vs 4.06±2.26; p <0.001). No statistically significant differences were observed in the frequency of PA between the sexes (Table 1).

Table 1. Descriptive analysis of cardiovascular risk by sex (*N* = 1483).

		SEX				
		Female (n=745) n(%)/M(SD)		**Male (n=739) n(%)/M(SD)**		*p*
Smoking		245	32.9 %	285	38.6 %	0,021
Professional category	Faculty staff	409	54.9%	297	40,20%	<0,001
	Administrative personnel	336	45,10%	442	59.9%	
Type of contract	Official	328	44.0 %	440	59.5 %	<0,001
	Labour	417	56.0 %	298	40.3 %	
	Other	0	0.0 %	1	0.1 %	
Age	40-49	268	36.0 %	188	25.4 %	<0,001

	50-59	324	43.5 %	366	49.6 %	
	60-69	153	20.5 %	184	24.9 %	
Maximum TA	100-119	220	29.5 %	350	47.4 %	<0,001
	120-139	412	55.3 %	317	49,2 %	
	140-159	95	12.8 %	61	8.3 %	
	160-179	18	2.4 %	10	1.4 %	
Non-HDL Cholesterol (mmol/l)	3 - 3.9	497	66.7 %	484	65.6 %	0,85
	4 - 4.9	218	29.3 %	226	30.6 %	
	5 - 5.9	29	3.9 %	26	3.5 %	
	6 - 6.9	1	0.1 %	2	0.3 %	
Physical activity (N=1470)	Does not perform	189	25.6 %	195	26.7 %	0,972
Total Cholesterol (mg/dl)	<150	430	57.7 %	432	58.5 %	0,934
	150-199	294	39.5 %	284	38.4 %	
	200-249	21	2.8 %	22	3.0 %	
HDL Cholesterol (mg/dl)	<40	41	5.5 %	4	0.5 %	<0,001
	40-59	488	65.5 %	224	30.4 %	
	>=60	216	29.0 %	510	69.0 %	
Alcohol consumption	Don't drink	147	20.1 %	241	32.7 %	<0,001
	Daily	108	14.7 %	49	6.7 %	
	Weekends	96	13.1 %	70	9.6 %	
	Sporadic	380	51.8 %	365	50.3 %	
Total Cholesterol		203	26,1	215	26,4	<0,001
HDL Cholesterol		54,7	10,8	67,1	13,3	<0,001
LDL Cholesterol		129	22	131	21,5	0,074
SCORE2		3,00	1,91	4,06	2,26	<0,001
BMI		26,8	3,93	25,4	4,22	<0,001
Glucose		90,8	12	87,8	15,4	<0,001

Note. SD=standard deviation

Differences in cardiovascular profile by professional category

The proportion of individuals aged 40–49 years was lower among the administrative personnel than the faculty (26.1% vs 35.7%; $p < 0.001$). Regarding cardiovascular risk variables, a greater proportion of smokers were identified among administrative personnel than among faculty (44.2% vs 26.4%; $p < 0.001$). Additionally, there was a higher frequency

of physical inactivity (29.4% vs 22.0%; p = 0.005) and a lower proportion of daily drinkers (8.7% vs 12.6%; p = 0.004). The prevalence of systolic blood pressure administrative personnel readings of 140 mmHg or above was higher among administrative personnel than faculty (15.3% vs 9.2%; p = 0.006). The mean cholesterol levels were higher in the administrative personnel than in the faculty (211±26.6 vs 208±27.2; p = 0.017). However, no significant differences were observed in LDL, HDL, and non-HDL cholesterol levels, as well as in glucose levels. Similarly, no differences were observed in the prevalence of total cholesterol levels ≥200 mg/dL and HDL levels ≥60 mg/dL (Table 2).

Table 2. Descriptive analysis of cardiovascular risk by professional category (faculty/administrative personnel) and type of contract (government employees/non-government employees) (*N* = 1483).

		Faculty staff (n=705)		**Administrative personnel (n=778)**		*p*	**Government employees (n=768)**		**Non-government employees (n=715)**		*p*
		n(%)/M(SD)		**n(%)/M(SD)**			**n(%)/M(SD)**		**n(%)/M(SD)**		
Smoke	No	519	73.6 %	434	55.8 %	<0,001	513	66.8 %	440	61.5 %	0,035
	Yes	186	26.4 %	344	44.2 %		255	33.2 %	275	38.5 %	
Age	40-49	253	35.7 %	203	26.1 %	<0,001	168	21.9 %	288	40.3 %	<0,001
	50-59	287	40.7%	403	51.8 %		371	48.3 %	319	44.6 %	
	60-69	165	23.4 %	172	22.1 %		229	29.8 %	108	15.1 %	
Maximum TA	100-119	282	40.0%	288	37.0 %	0,006	283	36.8 %	287	40.1 %	0,352
	120-139	358	50.8 %	371	47.7 %		393	51.2 %	336	47.0 %	
	140-159	55	7.8 %	101	13.0 %		80	10.4 %	76	10.6 %	
	160-179	10	1.4 %	18	2.3 %		12	1.6 %	16	2.2 %	
Non-HDL Cholesterol (mmol/l)	3 - 3.9	485	68.8 %	496	63.8 %	0,202	528	68.8 %	453	63.4 %	0,106
	4 - 4.9	195	27.7 %	249	32.0 %		214	27.9 %	230	32.2 %	
	5 - 5.9	24	3.4 %	31	4.0 %		24	3.1 %	31	4.3 %	
	6 - 6.9	1	0.1 %	2	0.3 %		2	0.3 %	1	0.1 %	
Physical activity	Does not perform	155	22.0 %	229	29.4 %	0,005	177	23.3 %	207	29.2 %	0,04

	1 day/week	77	10.9 %	51	6.6 %		60	7.9 %	68	9.6 %	
	2 days/week	140	19.9 %	160	20.6 %		161	21.2 %	139	19.6 %	
	3 days/week	125	17.7%	122	15.7%		123	16.2 %	124	17.5 %	
	4 days/week	62	8.8 %	75	9.6%		77	10.1 %	60	8.5 %	
	5 days/week	60	8.5 %	68	8.7 %		72	9.5 %	56	7.9 %	
	6 days/week	20	2.8 %	23	3.0 %		25	3.3 %	18	2.5 %	
	7 days/week	57	8.1 %	45	5.8 %		64	8.4 %	38	5.4 %	
Total Cholesterol	<150	432	61.3 %	430	55.3%		461	60.0 %	401	56.1 %	
	150-199	255	36.2 %	323	41.5 %	0,062	288	37.5 %	290	40.6 %	0,238
	200-249	18	2.6 %	25	3.2 %		19	2.5 %	24	3.4 %	
HDL Cholesterol	<40	21	3.0 %	24	3.1 %		16	2.1 %	29	4.1 %	
	40-59	342	48.5 %	370	47.6 %	0,933	327	42.6 %	385	53.8 %	<0,001
	>=60	342	48.5%	384	49.4 %		425	55.3 %	301	42.1 %	
Drink	Don't drink	159	22.6 %	229	29.4 %		197	26.0 %	191	27.3 %	
	Daily	89	12.6%	68	8.7 %		77	10.2 %	80	11.4 %	
	Weekends	87	12.3 %	79	10.2 %	0,004	84	11.1 %	82	11.7 %	0,807
	Sporadic	356	50.5 %	389	50.0 %		3991	52.6 % 0.1 %	3461	49.4 % 0.1 %	
Total Cholesterol		208	27,2	211	26,6	0,17	210	26,8	208	27	0,232
HDL Cholesterol		60,6	13,6	61,2	13,7	0,464	62,6	13,5	59	13,6	<0,001
LDL Cholesterol		129	21,8	131	21,7	0,136	130	21,4	130	22,1	0,785
SCORE2		3,2	2,18	3,82	2,1	<0,001	3,83	2,22	3,21	2,05	<0,001
IMC		25,4	3,71	26,7	4,4	<0,001	25,8	3,88	26,4	4,36	0,01
Glucose		88,2	10,3	90,3	16,4	0,076	89,4	14,7	89,1	12,9	0,862

Note. SD=standard deviation

The mean body mass index was higher in the administrative personnel than in the faculty (26.7 ± 4.40 vs 25.4 ± 3.71; p < 0.001). Finally, the risk of morbidity and mortality was found to be higher in the administrative personnel than in the faculty (3.82±2.10 vs 3.20±2.18; p<0.001). The discrepancies in the probability of developing CVD and mortality between faculty and administrative personnel, adjusted for sex, tobacco consumption, age, non-HDL cholesterol level, and BP levels, are illustrated in Figure 1.

Figure 1: Heat map of cardiovascular risk according to faculty and administrative personnel. <50 years: green <2.5%, orange 2.5 to 7.5%, red >7.5%. 50 to 69 years: green <5%, orange 5 to 10%, red >10%.

		Faculty staff												Administrative personnel											
		Women						Men						Women						Men					
		Non-smoker				Smoker		Non-smoker				Smoker		Non-smoker				Smoker		Non-smoker				Smoker	
		Non-HDL Cholesterol																							
Age groups	Max blood pressure	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9
65-69	160-179																		11.7					12.8		
	140-159		7.2			10.0	9.6		7.0			13.3		7.6				10.0		8.6			12.2		11.2
	120-139	5.1	5.1			8.3	7.8		8.3	6.9	7.0	8.5	9.8	5.5	4.8		7.1	9.6		6.7	7.0		9.6			
	100-119	3.8	4.6			7.2			4.9			7.9	8.0	9.3	3.6	3.8			7.6		5.3		6.4	7.0			
60-64	160-179					7.7	11.4					11.6				5.6	5.0	10.5	9.4	7.3			9.8		13.0	
	140-159	5.2				8.3	7.2	7.3	4.4	7.0	5.7	8.9			5.4	4.5	5.2	8.0	7.9	5.7	7.2		11.6	11.1		
	120-139	4.7	4.0			7.5	6.3		5.1	6.4	4.9	8.8	8.3		4.9	4.2	4.5	6.8	7.9	6.0	6.2	7.0	9.1	9.8	10.6	
	100-119	3.5	3.3			6.3	4.9	6.1	4.8	5.3		6.6	7.1		3.0		4.0	3.7		5.2	4.7		7.7	8.0	7.5	
55-59	160-179	4.5				4.6			6.4		8.2	7.8	7.6		4.1	4.8		7.7								
	140-159	4.3	3.8			6.5	5.8		4.5	4.4		5.6	6.8		4.0	4.2			6.9	8.0	4.7	5.5	6.6	6.5	7.9	
	120-139	3.4	3.2	3.4		5.2	5.6		4.7	4.4		6.3	8.5	5.7	7.8	3.3	3.6		6.1	6.1	5.3	3.9	4.5	4.8	6.8	8.1	8.2
	100-119	2.5	2.9	2.8		4.0	4.7	6.3	3.8	4.0	3.8	5.7	6.6			2.7	2.8		5.3	5.5		3.5	4.3	3.8	5.5	5.7	6.5
50-54	160-179	3.1				5.5	6.1							9.3		2.7							5.5				
	140-159	2.6	3.1			5.0	5.7					5.8				3.1	2.5		5.9	4.7		4.3			6.4		
	120-139	2.5	3.0	2.8		4.5	4.6		3.2	4.0	3.3	5.2	5.6			2.4	2.6	2.5	4.4	5.5		3.1	3.8		4.9	6.2	
	100-119	1.9	2.3			3.4	3.9		2.8	2.3		4.4	5.2			1.8	1.8	1.7	3.9	2.9		3.0	3.0	2.9	4.6	5.3	
45-49	160-179	2.5		3.5												2.8	2.1										
	140-159	2.6	1.8			3.3										2.1	2.1			3.3		2.1					
	120-139	1.6	1.6	1.9	1.2	3.9	3.9	3.8	2.4	2.8		4.6	4.3			1.7	1.9	1.4	3.2	3.5		2.2	2.9	3.1	4.5	4.3	
	100-119	1.6	1.3	1.3		2.8	2.9		2.0	1.9	2.1	3.8	4.5			1.5	1.1		2.7	2.3		2.1	2.0		3.2	4.4	
40-44	160-179																			5.1							
	140-159					3.3	3.4									1.7				3.3		2.0			6.0		
	120-139	1.2	1.1	1.4		2.6	2.5		1.6	1.7		2.4	3.8			1.3	1.3	1.0	2.4	3.2		1.8	1.3		3.2	5.3	
	100-119	1.1	1.0			1.9	2.8		1.7	1.5		2.5	1.4			1.1	0.9	0.7	2.3	1.2		1.4	1.0		2.7		

Differences in cardiovascular risk profile by type of contract

The proportion of individuals aged between 40 and 49 years was higher in the group with a non-government employment contract compared to those with a government employment contract (40.3% vs 21.9%; p < 0.001). About cardiovascular risk variables, a

higher proportion of smokers was observed among the non-government employees (38.5% vs 33.2%; p = 0.035) and a higher frequency of physical inactivity (29.2% vs 23.3%; p = 0.04), with no differences identified in daily alcohol consumption or in the frequency of systolic blood pressure ≥140 mmHg. The prevalence of HDL cholesterol levels ≥60 mg/dL was lower among the non-government employees compared to the government employees (42.1% vs 55.3%; p < 0.001). Furthermore, the overall mean HDL cholesterol levels were higher in the government employees compared to the non-government employees (62.6 ± 13.5 vs 59 ± 13.6; p < 0.001). However, no differences were observed in the frequency of total cholesterol levels exceeding 200 mg/dL, as well as in the levels of non-HDL cholesterol, LDL cholesterol, and overall total cholesterol levels, and in glucose levels (Table 2). As indicated by SCORE2, the risk of cardiovascular morbidity and mortality was lower among non-government employees (3.21 ± 2.05 vs. 3.83 ± 2.22; p < 0.001). The discrepancies in cardiovascular risk between government employees and non-government employees, adjusted for sex, tobacco use, age, non-HDL cholesterol level, and BP levels, are illustrated in Figure 2.

Figure 2: Heat map of cardiovascular risk among government employees and non-government employees. <50 years: green <2.5%, orange 2.5 to 7.5%, red >7.5%. 50 to 69 years: green <5%, orange 5 to 10%, red >10%.

		Government employees														Non government employees											
		Women							Men							Women						Men					
		Non-smoker				Smoker			Non-smoker				Smoker			Non-smoker			Smoker			Non-smoker			Smoker		
		Non-HDL Cholesterol							Non-HDL Cholesterol							Non-HDL Cholesterol						Non-HDL Cholesterol					
Age groups	Max Blood Pressure	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	3-3.9	4-4.9	5-5.9	6-6.9	3-3.9	4-4.9	5-5.9	6-6.9
65-69	160-179																		12									
	140-159	7.6	7.2				10.0		7				13.3		11	5.3	6.2		10			8.6			12				
	120-139	5.5	4.8			9.1	9.6		8.3	6.9	7		9.6	9.8		4.7	5.1		7.5			6.5	7						
	100-119	3.8	4.6			7.2	7.6		4.9		6.4		7.9	8								5.3			6.6		9.3		
60-64	160-179					7.7			7.3				12		13		5.6	5	10						9.4				
	140-159	4.6	4.5			8.3	7.2	7.3	5.7	7	5.7		12	8.9		5.4	4.4	5.2	7	7.9			7.2		8.2	11			
	120-139	4.7	4	4.2		7.5	7		6	6.4	7		9.1	9.8		4.9	3.3	4.5	6.8	7.9		5.1	4.5	4.9	8.3	9.5	11		
	100-119	3.5	3.5			3.7			5.2	4.6			7.7	8	7.5	2.8	3.3	4	6.3	4.9	6.1	4.1	5.3		6.5	6.8			
55-59	160-179	4.5											7.8			3.9	4.5		7.7					8.2	7.5	7.6			
	140-159	4.3					5.8		4.3	4.4		5.6	7.6	7.9		4	4.2		6.5	6.9	8	4.7	5.5	6.6	6.8	7.9			
	120-139	3.3	3.2	3.4		5.7	5.6		4.7	4.5	4.8		6.8	7	8.2	3.4	3.6		6.1	6.1	5.3	3.8	4.4	4.1	6.5	8.5		7.8	
	100-119	2.7	2.9			4.6			3.7	3.5	3.8		5.7	6.6		2.7	2.5	2.8	5.3	5.5	6.3	3.8	4.3		5.5	6.2	6.5		
50-54	160-179	2.7				5.5																					9.3		
	140-159	3	2.7			5			4.3	3.6			6.4			3.1	3.1		5.9	5.7					6				
	120-139	2.3	3	2.5		4.4	5.5		3.2	4			4.9	6.2		2.5	2.6	2.8	4.5	4.6		3.1	3.8	3.3	5.2				
	100-119	1.8	1.5			3.4			3	3			4.6	5.3		1.9	2.3	1.7	3.9	3.9		2.5	2.6	2.9	4.6	4.4			
45-49	160-179	2.8															2.1												
	140-159	1.6	2.1													2.6			3.3	3.3		2.1							
	120-139	1.7	1.6	1.9	1.2	2.6	3.2		2.3	2.9	3.1		4.6	4.3		1.7	1.9		3.9	3.9	3.9	2.4	2.7		4.5	4.3			
	100-119	1.6	1.3			2.7	2.8		1.9	1.8			3.2	4.5		1.3	1.3	1.3	2.8	2.9		2.1	2	2.1	3.8	4.4			
40-44	160-179																			5.1									
	140-159	1.7												6		1.4			3.3	3.4		2							
	120-139	1.3				2.3	2.2		1.4	1.7			2.4	3.8		1.2	1.3	1.4	2.6	3.2		1.9	1.3		3.2	5.3			
	100-119	1	1	0.7		1.8	2.8		1.4							1.1	1		2.3	2.1		1.7	1.5		2.7	1.4			

Differences in the cardiovascular risk profile by professional category and type of contract

A comparison of the administrative personnel and faculty groups, stratified by type of contract (non-government employees vs. government employees), revealed that the administrative personnel non-government employees engaged in less (30.8%) than the faculty government employees, who exhibited a higher frequency of 6-7 days a week ($p = 0.006$). The group with the highest frequency of blood pressure between 160 and 179 mmHg was also the administrative personnel non-government employees, in comparison to the faculty non-government employees, which had a lower frequency (3.2% vs 1.0%; $p < 0.001$). The group with the highest frequency of daily alcohol consumption was the faculty non-government employees (13.4%), while the group with the highest abstinence was the administrative personnel government employees (31.5%) ($p = 0.024$). The prevalence of tobacco use was higher among work-related administrative personnel non-government employees (46.8%) compared to faculty government employees, who exhibited the highest frequency of abstinence (74.3%) ($p < 0.001$). Ultimately, the cohort exhibiting the highest risk

of cardiovascular morbidity and mortality (>7.6%) was the administrative personnel government employees (7.1%), as well as the group with the highest moderate cardiovascular risk (20.1%). The group with the lowest cardiovascular risk (less than 2.5%) was the faculty non-government employees (57.4%), as evidenced by a p-value of less than 0.001. No differences were observed in pooled cholesterol levels or non-HDL cholesterol levels (Table 3).

Table 3. Descriptive analysis of cardiovascular risk by type of contract and professional category (*N* = 1483).

		Administrative personnel government employees n (%)	**Administrative personnel non-government employees n (%)**	**Faculty staff government employees n (%)**	**Faculty staff non-government employees n (%)**	*p*
Sex	Woman	95 (25.8%)	241 (58.8%)	233 (58.3%)	176 (57.7%)	**<0.001**
	Man	273 (74.2%)	168 (41.3%)	167 (41.8%)	129 (42.3%)	
Age grouped	40-49	76 (20.7%)	127 (31.2%)	92 (23.0%)	161 (52.3%)	**<0.001**
	50-59	192 (52.2%)	211 (51.5%)	179 (44.8%)	108 (35.4%)	
	60-69	100 (27.2%)	72 (17.7%)	129 (32.3%)	36 (11.7%)	
Systolic blood pressure grouped	100-119	144 (39.1%)	144 (35.1%)	139 (34.8%)	143 (46.9%)	**<0.001**
	120-139	178 (48.4%)	193 (47.4%)	215 (53.8%)	143 (46.4%)	
	140-159	41 (11.1%)	60 (14.7%)	39 (9.8%)	16 (5.2%)	
	160-179	5 (1.4%)	13 (3.2%)	7 (1.8%)	3 (1.0%)	
Non-HDL CholesterolGroup	3-3.9	244 (66.3%)	252 (61.5%)	284 (71.0%)	201 (65.9%)	0.144
	4-4.9	110 (29.9%)	139 (33.9%)	104 (26.0%)	91 (29.8%)	
	5-5.9	12 (3.3%)	19 (4.7%)	12 (3.0%)	12 (3.9%)	
	6-6.9	2 (0.5%)	0 (0.0%)	0 (0.0%)	1 (0.3%)	
Physical activity	No activity	103 (28.3 %)	126 (30.8%)	74 (18.7 %)	81 (26.9%)	**0.006**
	1 to 2 days/week	100 (27.5 %)	111 (27.1%)	121 (30.6 %)	96 (31.9%)	
	3 to 5 days/week	125 (34.3 %)	140 (34.2 %)	147 (37.2 %)	100 (32.9 %)	
	6 to 7 days/week	36 (9.9 %)	32 (7.9 %)	53 (13.4 %)	24 (7.9 %)	
Cholesterol grouped 150-250	<150	212 (57.6%)	218 (53.2%)	249 (62.3%)	183 (60.0%)	0.24
	150-199	146 (39.7%)	177 (43.2%)	142 (35.5%)	113 (37.0%)	
	200-249	10 (2.7%)	15 (3.7%)	9 (2.3%)	9 (2.9%)	
Drink	Don't drink	114 (31.5%)	115 (28.7%)	83 (21.0%)	76 (25.4%)	**0.024**
	Daily	29 (8.0%)	39 (9.5%)	48 (12.1%)	41 (13.4%)	
	Weekends	33 (9.1%)	46 (11.5%)	51 (12.9%)	36 (12.0%)	
	Sporadic	185 (51.1%)	204 (49.8%)	214 (54.0%)	142 (46.6%)	

	Former drinker	1 (0.3%)	0 (0.0%)	0 (0.0%)	1 (0.3%)	
Smoking	No	216 (58.7%)	218 (53.2%)	297 (74.3%)	222 (72.8%)	**<0.001**
	Yes	152 (41.3%)	192 (46.8%)	103 (25.8%)	83 (27.2%)	
SCORE	<2.5%	95 (25.8%)	143 (34.9%)	149 (37.3%)	175 (57.4%)	**<0.001**
	2.5 to 5%	173 (47.0%)	169 (41.5%)	159 (39.8%)	102 (33.1%)	
	5.1 to 7.5%	74 (20.1%)	77 (18.8%)	64 (16.0%)	17 (5.6%)	
	>7.6%	26 (7.1%)	21 (5.2%)	28 (7.0%)	11 (3.6%)	

Table 4. Multivariate logistic regression model for predicting cardiovascular risk and physical activity

					95% Confidence Interval	
		Predictor	**p**	**OR**	**Inferior**	**Superior**
Administrative personnel government employees - Faculty staff government employees	Physical activity	1 to 2 days/week – No activity	**0.010**	0.590	0.395	0.881
		3 to 5 days/week – No activity	**0.011**	0.609	0.414	0.894
		6 to 7 days/week – No activity	**0.004**	0.465	0.276	0.783
	SCORE2	2,5 al 5% – <2,5%	**0.002**	1.695	1.208	2.377
		5,1 al 7,5% – <2,5%	**0.004**	1.869	1.220	2.863
		>7,6% – <2,5%	0.155	1.563	0.845	2.891
Administrative personnel non-government employees - Faculty staff government employees	Physical activity	1 to 2 days/week – No activity	**0.001**	0.529	0.359	0.779
		3 to 5 days/week – No activity	**0.002**	0.552	0.381	0.799
		6 to 7 days/week – No activity	**<0 .001**	0.345	0.204	0.585
	SCORE2	2,5 al 5% – <2,5%	0.567	1.097	0.798	1.509
		5,1 al 7,5% – <2,5%	0.185	1.318	0.876	1.981
		>7,6% – <2,5%	0.551	0.824	0.436	1.557
Faculty staff non-government employees - Faculty staff government employees	Physical activity	1 to 2 days/week – No activity	0.152	0.737	0.485	1.119
		3 to 5 days/week – No activity	**0.027**	0.630	0.418	0.949
		6 to 7 days/week – No activity	**0.009**	0.459	0.256	0.823
	SCORE2	2,5 al 5% – <2,5%	**<0 .001**	0.528	0.378	0.738
		5,1 al 7,5% – <2,5%	**< 0.001**	0.236	0.132	0.421
		>7,6% – <2,5%	**0.009**	0.372	0.177	0.783

Note: The interaction analysis between explanatory variables did not reach a significant value

Results of the multinomial logistic regression model

The results of the multinomial logistic model (Table 4) indicate that, in comparison to faculty government employees, administrative personnel government employees are less likely to engage in mild PA (OR = 0.59; 95% CI 0.39-0.88), moderate activity (OR = 0.61; 95% CI 0.41-0.89), or vigorous activity (OR = 0.47; 95% CI 0.28-0.78). The risk of mild cardiovascular morbidity and mortality is higher for administrative personnel government employees (OR = 1.67; 95% CI 1.21-2.38) and moderate morbidity (OR = 1.87; 95% CI 1.22-2.86) compared to that of faculty government employees. With regard to the discrepancies between the administrative personnel non-government employees and the faculty government employees, the first group is less prone to engage in mild PA (OR = 0.53; 95% CI 0.36-0.78), moderate (OR = 0.55; 95% CI 0.38-0.80), and vigorous PA (OR = 0.35; 95% CI 0.20-0.59). However, no associations were identified regarding the risk of cardiovascular morbidity and mortality. Finally, the administrative personnel non-government employees are less likely to engage in moderate PA (OR = 0.63; 95% CI 0.42-0.95) and vigorous PA (OR = 0.46; 95% CI 0.26-0.82) compared to the faculty government employees. However, they exhibit a reduced risk of mild (OR = 0.53; 95% CI 0.38-0.74), moderate (OR = 0.24; 95% CI 0.13-0.42), and severe (OR = 0.37; 95% CI 0.18-0.78) CVD.

Discussion

The findings indicated that the administrative personnel (with a government contract) exhibited the highest risk of cardiovascular morbidity and mortality. Despite the lower risk of cardiovascular morbidity and mortality observed in our sample of women when calculated with SCORE2, elevated levels of individual cardiovascular risk markers were evident, including higher blood glucose levels, higher BMI, and a greater frequency of daily alcohol consumption. These findings diverge from those of Gómez-Sánchez et al. (2024). Their study revealed that alcohol consumption was higher in men and exhibited a positive

correlation with cardiovascular risk estimated using the SCORE method. In the study conducted by Norte Navarro et al. (2016) at the University of Alicante, it was found that 12% of women and 10.5% of men over the age of 44 were obese, and that 23.7% of men and 32% of women did not engage in PA.

Among the administrative personnel, we observed a higher prevalence of smoking, less physical activity, elevated blood pressure, higher cholesterol levels, higher BMI, and an increased risk of cardiovascular morbidity and mortality. Among them the group of non-government employees exhibited higher rates of tobacco consumption, lower levels of PA, and lower HDL cholesterol levels. However, it was the administrative personnel government employees that demonstrated the highest risk of cardiovascular morbidity and mortality. The results of the statistical model indicate that faculty government employees are associated with a lower risk of CVD compared to administrative personnel government employees

In the study by López González et al.(2022) a sample of 4,738 professors from various regions of Spain was analyzed, resulting in moderate or high SCORE values of 11.4%, a hypercholesterolemia prevalence of 41%, 12.1% of hypertriglyceridemia, 15.5% of hypertension, and 13% of obesity according to BMI. The results appear to indicate that administrative personnel exhibit a heightened cardiovascular risk compared to the faculty group, characterized by less favorable health habits, elevated scores in biological markers of risk and an increased likelihood of developing CVD or mortality from such conditions. These findings are corroborated by the distribution of cardiovascular morbidity and mortality risk in Figure 1, which illustrates a more pronounced distribution of cardiovascular risk above 7.5% in administrative personnel compared to the faculty. Additionally, the data indicate that government employees exhibit a superior cardiovascular profile compared to non-government employees, as illustrated in Figure 2, which depicts a higher prevalence of cardiovascular risk between 2.5 and 7.5% and above 7.5% in the non-government employees. However, these data must be stratified according to the professional category

and should not be considered alone. This is demonstrated in Table 3 and in the multinomial logistic regression model (Table 4).

In both descriptive and predictive analyses, it is observed that faculty non-government employees have a lower risk of cardiovascular morbidity and mortality than faculty government employees and administrative personnel government employees. The faculty non-government employees have a lower incidence of cardiovascular morbidity and mortality than the faculty government employees, despite having less favorable PA habits. This phenomenon is also observed in the administrative personnel, non-government employees, which does not present a greater cardiovascular risk, despite exhibiting less favorable PA habits. It is therefore recommended that the assessment of cardiovascular morbidity and mortality risk should consider both variables, namely occupational category and cardiovascular risk.

Several factors may account for the observed results. Primarily, the discrepancy between the non-government and government employees may be attributed to the age distribution of the two groups. It is also possible that personnel employed on a temporary basis may be required to dedicate a greater proportion of their time to work-related activities, and to other responsibilities such as childcare, which could potentially impact their ability to engage in PA. In addition, the discrepancies in cardiovascular risk markers between the faculty and the administrative personnel may be attributed to socioeconomic status, cultural influences, or academic training. In the ENPE study on the prevalence of obesity and associated cardiovascular risk factors in the Spanish general population. It was found that the higher the socioeconomic level, the lower the cardiovascular risk (Pérez-Rodrigo et al., 2022). Therefore, the interrelation of age conditions and the influence of cultural and socioeconomic variables may explain the discrepancy in cardiovascular morbidity and mortality risk markers between groups according to professional category and type of contract, beyond the traditional biological risk factors or the healthy habits themselves. In comparison with our results, other authors have identified studies that yielded similar

findings. For instance, the study conducted at the Faculty of Medicine at the University of El Salvador among faculty revealed a high prevalence of cardiovascular risk, with a higher prevalence observed in male administrative personnel (Orellana-Cornejo & Rodríguez-Funes, 2019). However, the study by Lozano-Casanova et al. (2023) indicates a higher prevalence of cardiovascular risk factors among faculty compared to administrative personnel, despite the latter group having a more sedentary lifestyle. The use of cardiovascular risk calculation allows for the prioritization of prevention and health promotion measures for the health team (Blanes & Saura, 2024), which are essential for the implementation of healthy university models (Martínez-Sánchez & Balaguer, 2016).

The study was limited by the absence of data on additional cardiovascular risk factors, including socioeconomic status, academic training, age at menopause in women, and the presence of mood disorders such as depression. This study's key strength lies in its adequate sample size, which minimized sampling error. To the best of our knowledge, no other studies have compared different professional categories and types of contracts within a Spanish public university. Another limitation of this study is the exclusion of "cardiorespiratory fitness" as a variable, as only physical activity data were collected. Cardiorespiratory fitness is an important determinant of health outcomes and may provide additional insight into the relationship between physical activity and various health indicators (Kaminsky et al., 2019). Future research should consider including this variable to offer a more comprehensive understanding of the effects of physical activity on health.

In conclusion, with respect to faculty government employees, administrative personnel government employees exhibit reduced levels of PA and demonstrate an elevated risk for CVD. Furthermore, administrative personnel non-government employees also engage in less PA, although no relationship was identified at the level of risk. With respect to faculty non-government employees, faculty government employees engage in more PA, yet exhibit a higher prevalence of cardiovascular risk factors than their counterparts.

Implications for Occupational Health Nursing Practice or Implications for Occupational Health Practice

The SCORE2 cardiovascular risk estimation model, endorsed by the ESC, is a valuable tool for identifying the risk factors associated with sedentary lifestyles among university workers and for developing health promotion programs to encourage healthier behaviors at work. In this study, the differences in the sample have been identified according to the professional category and type of contract. It is recommended that the improvement of PA programs for workers be planned by the Occupational Health Service, with input from occupational nurses who are best positioned to understand the nuances of the work environment and the characteristics of the workers.

Applying Research to Occupational Health Practice

We examined whether the estimation of cardiovascular risk derived from the SCORE2 model would be associated with PA, type of work and type of contract, and found that there is more physical inactivity in the faculty and administrative personnel. Occupational health nurses in the Occupational Health Service of Universities should try to develop prevention and health promotion campaigns on the enhancement of PA physical activity in leisure time, as well as exercises to combat sedentary lifestyles in the workplace.

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Conflict of interest

The authors declare that there are no potential conflicts of interest regarding the research, authorship and/or publication of this article.

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Contribution of the authors

M.H. contributed to the conceptualization of the study, data acquisition, supervision and the draft of the manuscript. MIRP contributed to the collection of data for the study. D.P., and G.M. contributed methodology, study data analysis, and manuscript draft. AMM, AMP, and LIMS contributed to the manuscript review. All authors participated in the manuscript review and final approval process.

Ethical considerations

This research has received a favorable report from the research ethics committee of the Complutense University of Madrid (UCM) on 9 February 2023, reference CE_20230713_14_SAL and has been carried out in accordance with the provisions of the latest version of the Declaration of Helsinki and laws 14/2007 and 41/2002. The data collected was processed in accordance with the European Union's General Data Protection Regulation (GDPR) and Organic Law 3/2018, of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights (LOPDGDD).

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