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RESEARCH ARTICLE

Prevalence of Cardiovascular Risk Factors in a University Population: Differences Between Faculty, Administrative Staff and Students

Mar Lozano-Casanova[a], José Miguel Martínez-Sanz[a,b], Isabel Sospedra[a,b,*], José Antonio Hurtado[a,b], Rocío Ortiz-Moncada[a,b], Ana Laguna-Pérez[a], Aurora Norte[a,b]

[a] Nursing Department, Faculty of Health Science, University of Alicante, Alicante, Spain.
[b] Research Group on Food and Nutrition (ALINUT), Nursing Department, Faculty of Health Science, University of Alicante, Alicante, Spain.

***isospedra@ua.es**

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ABSTRACT

Introduction: Globally, 31% of deaths are attributed to cardiovascular disease (CVD). There are many factors that can influence CVD that can be useful for determining if a population is at risk; these factors include stress, occupation, and lifestyle. Objective: to identify and compare the prevalence of CVD risk factors among those attending a university clinic for nutritional advice.

Methodology: The sample of this cross-sectional study included the teaching and research staff (Faculty), people working in administration and services (ASS) and students. The risk factors of obesity/overweight, hypertension, hypercholesterolemia, diabetes type 2, sedentary lifestyle, and smoking were quantified for 98 university students, faculty and staff.

Results: It was found that 80% of the sample had one or more of the CVD risks, furthermore, more than 50% had over three of the risk factors. Those particularly at risk were the individuals within the Faculty group with a (p<0.05) prevalence of having three of the risk components compared to the rest of the population. However, those within the ASS group were identified to live a more sedentary lifestyle compared to the Faculty (p<0.05). Within this sample population differences could be found for the prevalence of CVD risk factors.

Conclusions: To be able to provide preventative measures and protect those who are most vulnerable it is crucial to be able to pinpoint these differences within a population.

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> **Prevalencia de factores de riesgo cardiovascular en población universitaria: diferencias entre docentes, administrativos y estudiantes**

RESUMEN

Introducción: A nivel mundial, el 31% de las muertes se atribuyen a enfermedades cardiovasculares (ECV). Hay muchos factores que pueden influir en las ECV que pueden ser útiles para determinar si una población está en riesgo; estos factores incluyen el estrés, el tipo de trabajo y el estilo de vida. Objetivo: Identificar y comparar la prevalencia de los factores de riesgo de ECV de las personas que acuden a una clínica universitaria para recibir asesoramiento nutricional.

Metodología: La muestra de este estudio transversal estaba formada por personal docente e investigador (PDI), personal de administración y servicios (PAS) y estudiantes, sumando un total de 98 personas. Se evaluaron los siguientes factores de riesgo cardiovascular: sobrepeso/obesidad, hipertensión arterial, hipercolesterolemia, diabetes mellitus tipo 2, sedentarismo y tabaquismo.

Resultados: Se encontró que el 80% de la muestra presentaba uno o más de los factores de riesgos de ECV. Además, más del 50% presentaba más de tres de los factores de riesgo. Aquellos particularmente en riesgo fueron los individuos dentro del grupo PDI con una prevalencia (p<0.05) de tener tres de los componentes de riesgo en comparación con el resto de la población. Sin embargo, aquellos dentro del grupo PAS fueron identificados con un estilo de vida más sedentario en comparación con los PDI (p<0,05). Dentro de esta muestra de población se pueden encontrar diferencias en la prevalencia de factores de riesgo de ECV.

Conclusiones: Para poder proporcionar medidas preventivas y proteger a los más vulnerables, es crucial poder identificar estas diferencias dentro de una población.

KEY MESSAGES

1. The university population that attends to a university clinic for nutritional advice have a high risk of developing illnesses related to nutritional status such as the cardiovascular disease.

2. Different cardiovascular disease risk factors have been found depending on the work position at the University.

3. Knowing the main cardiovascular disease risk factors affecting all university staff and students could help to design more efficient prevention strategies by adapting them to the real and specific necessities of the people.

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INTRODUCTION

From 2006 to 2016, deaths related to cardiovascular disease (CVD) have increased by 14.5% leading the causes of death in Europe, and Ischemic Heart Disease (a type of CVD) was the main cause off years of life lost in most European countries[1].

In order to determine the risk of developing CVD, several risk factors have been identified and thoroughly studied. The World Heart Federation (WHF) established the following factors for CVD: physical inactivity, tobacco use, diet, high blood cholesterol level (>200 mg/dL), high triglyceride level (>150 mg/dL), high blood pressure/hypertension (>120/80 mmHg), obesity (measured with the BMI and the waist circumference), diabetes, family history, age, gender, ethnicity and socioeconomic status[2–4]. Furthermore, The National Heart, Lung and Blood Institute (NHLBI) established the risk factors for Coronary Heart Disease (CHD), which includes all the risk factors for CVD[5]. Tobacco use has been described as one of the CVD risk factors. Former smokers have an intermediate CV risk between smokers and nonsmokers[6]. To maintain an unhealthy diet and the frequency and timing of meals may also affect cardiovascular health[5,7,8]. Physical inactivity is also considered a CVD risk factor and had showed an direct relationship with CVD[9], and combined it with an a sedentary work increases the risk of CVD. Recent studies have shown that individuals in office-based occupations[10], like at university, have low levels of physical activity. In some of these studies about 40% of university workers were classified as sedentary[11,12]. Physical activity may contribute to the prevention of CVD and more research to elucidate the role of the workplace environment in influencing physical activity is needed[12].

The risk for CVD varies between men and women, and CVD risk assessment may be considered in men >40 years of age and in women >50 years of age or postmenopausal with no know CVD risk factors. According to the NHBLI, CVD risk increases around the age of 45 in men and at the age of 55 in women[5].

Other factors can play a role in increasing the risk for CVD such as the type of work and study environment. Since people spend most of their time at work, it has been important to evaluate the workplace and study center environment and how it impacts on the workers' or students' health status. Some studies about the type of job found that long working hours could increase the risk of CVD and CHD[13,14]. Job strain and the type of job have also been associated with a moderately elevated risk of CHD and stroke. These associations between diverse job sectors and CVD are important for public health intervention initiatives and prioritization[15,16]. The participants working in the field of Education as a teachers have one of the lowest prevalence of type 2 diabetes compared with those working in Administrative and Support Services. Moreover, working in the Public Administration and Defense, as well as the Unemployed/Homemaker group have shown the highest prevalence of obesity. Education is also one of the three sectors with the lowest prevalence of hypercholesterolemia[16]. However, no studies about how the different workplaces in the same institution affect CVD risk are available.

There is also evidence of high prevalence of CVD risk factors in university students in South America, given by their lipid profile and body composition[17,18]. The University community is a heterogeneous environment comprised of different population, while most of them are students, there are also the administration and services staff (ASS) and the teaching and research staff known as faculty[19]. It has been clearly identified that male university workers have a higher prevalence of obesity, compared to females[20]. However, there are not many studies that evaluate the difference of CVD risk, or even the health status, between faculty and the ASS, and the few studies that do it, it is evaluated as a group, being unable to see the differences between each group of staff[20,21].

The aim of the present study is to identify the prevalence of CVD risk factors among the entire university population at an age relevant to CVD risk, including students, faculty and administrative and services staff, that attend nutrition counseling and to evaluate the differences in every group. We hypothesize that the prevalence of CVD risk factors is higher in ASS compared to faculty members and students.

METHODOLOGY

Data Collection

We developed a cross-sectional study on the prevalence of CVD risk in a university population in Spain. The study population included to all the people (n=372) that attended to nutrition counseling between 4 years (2017-2020) at the nutrition and food cabinet, in the University of Alicante, Spain.

The data studied in the present study is referring to the first nutritional counseling visit.

The inclusion criteria included students, faculty workers and ASS workers who attended the nutrition cabinet. To study the population of the age at risk, in order to avoid cofounders, only men that were above 45 years old and women above 55 years old were selected, since that is the age where the risk for CVD increases for each gender[5,22]. As exclusion criteria, subjects with a previous diagnosed heart disease or heart problems.

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From the 372 initial participants, once inclusion and exclusion criteria were applied, the final sample was 98 (56 men and 42 women).

Ethical Considerations

The participants were informed of the procedures and a written informed consent was obtained. Ethical approval was granted by the University of Alicante's ethics committee (UA-2018-07-20).

Variables

The socioeconomic variables recorded and used in this study were sex, age (years), occupation (classified in students, faculty and ASS). Our outcome variables were factors that can increase the risk of CVD factors: Body mass index (BMI), waist circumference, high blood pressure, hyper-cholesterolemia, hyper-triglyceridemia, type 2 diabetes, current smoker, sedentary lifestyle.

The BMI was calculated by the formula $kg/(m^2)$ and divided into categories, following the World Health Organization (WHO) criteria: underweight (<18.5), normal weight (18.5 to 24.9), pre-obesity/overweight (25 to 29.9), and obesity (>30)[23]. Weight was measured in a TANITA BC-418 MA scale and it was recorded in kilograms (kg). Height was measured in cm with a wall height meter.

Waist circumference, was obtained with a Cescorf measuring tape in centimeters (cm). Waist circumference of ≥102 cm in men and ≥88 cm in women is considered to increase the risk of CVD[2].

The patients were asked about any previous pathologies according to medical diagnosis (self-reported) and were classified in hypertriglyceridemia, hypercholesterolemia, hypertension and diabetes type 2.

Among lifestyle factors, patients were asked about tobacco use (classified as current smoker or non-smoker), physical activity (PA) classified in the following groups according to the number of hours of PA per week: 0 to less than one hour per week, one hour, two, three, four or more than four hours per week. In this study, doing less than one hour of exercise per week was considered sedentary since it does not meet the WHO recommendation for physical activity[24].

Statistical Analysis

SPSS v21 was used for the descriptive study and the analysis of the variables and groups. The normal distribution was checked using the Kolmogorov-Smirnov test. Comparisons were analyzed by the Student's T-test for continuous variables (age) and two-tailed Chi-squared test for categorical variables (CVD risk factors and sex), and a Fisher exact test when the expected frequency for the Chi-square test was lower than 5 for more than 20% of the cases. Statistically significance threshold was p≤0.05.

RESULTS

The men were aged 45 to 69 (median=53.2, SD=7.3) years old, and the women were aged 55 to 68 (median=59.7, SD=3.8) years old. Significant differences between the sex and ages were found in the total sample (p<0.001) and in faculty and ASS groups (p=0.001 and p<0.001, respectively). In the Table 1 it is the distribution of the sample depending on their occupational status inside at university.

Table 2 presents the frequency cardiovascular risk factors. When extracting the data, it was observed that 89.8% of our sample was either overweight or obese, 91.1% of the men and 88% of the women. In addition, the group with the highest prevalence of obesity/overweight were the faculty (89.4%), followed by the

Table 1. Sample occupational status at university.

Occupational status	Men n (%)	Women n (%)	Total n (%)	p value
Faculty members	33 (70.2)	14 (29.8)	47 (48.0)	0.012*
ASS[1]	15 (44.1)	19 (55.9)	34 (34.7)	0.058
Students	8 (47.1)	9 (52.9)	17 (17.3)	0.355

[1]**ASS:** Administration and Services Staff; ***p value** ≤0.05.

Table 2. Prevalence of CVD risk factors depending on sample sexes.

CVD risk factors	Total n (%)	Men n (%)	Women n (%)	p value
Overweight and Obesity	88 (89.8)	51 (91.1)	37 (88.0)	0.796
Waist circumference	44 (44.9)	22 (39.3)	22 (52.4)	0.216
High Blood Pressure	23 (23.5)	14 (25.0)	9 (21.4)	0.834
Hyper-cholesterolemia	30 (31.6)	15 (26.8)	15 (35.7)	0.250
Hyper-triglyceridemia	2 (2.0)	1 (1.8)	1 (2.4)	0.676
Type 2 Diabetes	5 (5.1)	3 (5.4)	2 (4.8)	0.635
Current Smoker	11 (11.2)	7 (12.5)	4 (9.5)	0.753
Sedentary Lifestyle	32 (32.6)	15 (26.8)	17 (40.5)	0.076

students and the ASS, 88.2%, and 82.4% respectively. Regarding waist circumference, it was found that women were more at risk of developing a CVD than men (52.4% of women vs 39.3% of men). The highest prevalence for a waist circumference at risk were found in the ASS (53%) and the students (53%), followed by the faculty (32%), for a total of 44.9% of the sample.

Table 3 showed comparisons between the three groups studied among their CVD risk factors. Differences in waist circumference between ASS and faculty were statistically significant (p=0.050).

Furthermore, around 23.5% of the subjects were diagnosed with high blood pressure, with a higher frequency in men (25%) than in women (21.4%). From the subjects with high blood pressure, the highest prevalence belonged to the students, followed by the ASS and the faculty. Observing the prevalence of hypercholesterolemia, around 31.6% of the total sample was previously diagnosed with this condition and was more prevalent in women (35.7%) than in men (26.8%). From this group, around 30% of the faculty and 30% of the students had hypercholesterolemia, while a lower proportion were from the ASS group (26.5%). Only 2% of the sample had hypertriglyceridemia, one man, and one woman, one from faculty, and the another one from the students' group. Moreover, 5% of the sample was diagnosed with type 2 diabetes, which included one subject in faculty, one subject in ASS and three students. Additionally, 11% of the sample was current smokers, being more frequent in men (12.5%) than in women (9.5%). In the current smoker category, 9.5% were of the faculty, 21.4% of the

ASS and 6% of the students' group. Finally, 32.6% of the sample was considered as sedentary, being more frequent in women (40.5%) than in men (26.8%). The subjects from ASS (41.2%) were more sedentary than the subjects from faculty (25.5%) (p=0.026) and more than the students (29.4%), although no significant differences were found with this group.

When analyzing the number of CVD risk factors in each category (Table 4), the 84.7% of the total sample had at least one risk factor, with most of them having three risk factors (33.7%), followed by two risk factors (20.4%) and by four risk factors (18.4%). When splitting the sample by sex, 85.7% of the men had at least one risk factor, with three risk factors being the most prevalent group (37.5%). Likewise, 83.3% of the women in the study had at least one risk factor, the majority having between two and three risk factors, 23.8% and 28.6% respectively. However, no significant differences were found by gender.

When comparing the occupation status, also described in detail in Table 5, it was found that 89.4% of the faculty had at least one risk factor, 44.7% of them located in the 3-risk factor group and just 10.6% located in the 4-risk factor group. On the other hand, only 73.5% of the ASS were found to have at least one risk factor, where 23.5% of them had three risk factors and 23.5% had four risk factors. While having three CVD risk factors is more prevalent in the faculty, having four CVD risk factors is more prevalent in the ASS. From the students' group, 76.5% of them had at least one risk factor, with an equal distribution between having two

Table 3. Descriptive results regarding CVD risk factors depending occupational status at university, and the comparison between groups.

	Faculty n (%)	ASS[1] n (%)	Student n (%)	Faculty vs. ASS[1] (p value)	Faculty vs. Students (p value)	ASS[1] vs. Students (p value)
Total participants (n)	47	34	17			
CVD risk factors						
Overweight and Obesity	42 (89.4)	28 (82.4)	15 (88.2)	0.513	1	0.703
Waist circumference	15 (31.9)	18 (52.9)	9 (52.9)	0.050*	0.125	1
High Blood Pressure	8 (17.0)	7 (20.6)	7 (41.2)	0.683	0.091	0.183
Hypercholesterolemia	15 (31.9)	9 (26.5)	5 (29.4)	0.596	0.849	1
Hypertriglyceridemia	1 (2.1)	0 (0.0)	1 (5.9)	1	0.446	0.333
Type 2 Diabetes	1 (2.1)	1 (2.9)	3 (17.6)	1	0.054	0.102
Current Smoker	4 (9.5)	6 (21.4)	1 (5.9)	0.307	1	0.401
Sedentary Lifestyle	12 (25.5)	14 (41.2)	5 (29.4)	0.026*	0.511	0.305

[1]**ASS:** Administration and Services Staff; ***p value** ≤0.05.

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Table 4. Descriptive results referring to the quantity of risk factors that the sample obtained depending on sexes.

Number of risks factors	Total n (%)	Men n (%)	Women n (%)	p value
1 risk factor	7 (7.1)	5 (8.9)	2 (4.8)	0.696
2 risks factors	20 (20.4)	10 (17.8)	10 (23.8)	0.453
3 risks factors	33 (33.7)	21 (37.5)	12 (28.6)	0.379
4 risks factors	18 (18.4)	11 (19.6)	7 (16.7)	0.727
5 risks factors	3 (3.1)	1 (1.8)	2 (4.8)	0.392
6 risks factors	2 (2.0)	0 (0.0)	2 (4.8)	0.573

risk factors and having four risk factors (23.5% for both) and followed by the students having three risk factors (17.6%). No one from our sample had seven risk factors.

There was a significant association between the groups faculty and ASS, and faculty and students for the presence of three CVD risk factors (p=0.05 and p=0.048, respectively), being the prevalence of having three risk factors always higher in the faculty group.

prevalence presented in the study was for overweight/obesity, followed by waist circumference, sedentary lifestyle, and hypercholesterolemia. The study developed by Huerta, *et al.* assessed the risk of CVD in Mediterranean region and it found 74% of the patients to be overweight[25]. Their prevalence is lower than our results (89.8%). This difference could be due to that our sample was selected from the people attending a nutritional counseling session for the first time.

On the other hand, their prevalence of hypercholesterolemia, hypertension, and diabetes was very similar to our results. A big difference was found regarding the prevalence of smoking. The previous study found it to be 34% in men and 13% in women (current smokers)[25] but in our study, we found that the prevalence was lower than 13% in both groups. These differences could be accounted for the bigger age range (25 to over 85) that Huerta, *et al.* included.

The prevalence of diabetes type 2 was 5% in our study, being higher in men than in women. Our results are similar to those found by Huerta, *et al.*[25], but lower than another study that measured the prevalence for diabetes *mellitus* in a representative sample from Spain[26], which found diabetes *mellitus* in 13.8% of the sample. However, they studied all types of diabetes and our findings are only for type 2 diabetes.

Table 5. Frequency and associations between number of cardiovascular disease risk factors among university population by occupational status.

Number of risks factors	Faculty n (%)	ASS[1] N (%)	Students n (%)	Faculty vs. ASS[1] (p value)	Faculty vs. Students (p value)	ASS[1] vs. Students (p value)
1 risk factor	3 (6.4)	3 (8.8)	1 (5.9)	0.692	0.942	1
2 risks factors	11 (23.4)	4 (11.8)	4 (23.5)	0.183	0.992	0.464
3 risks factors	21 (44.7)	8 (23.5)	3 (17.6)	0.050*	0.048*	0.731
4 risks factors	5 (10.6)	8 (23.5)	4 (23.5)	0.119	0.230	1
5 risks factors	1 (2.1)	2 (5.9)	0 (0.0)	0.377	0.544	0.547
6 risks factors	1 (2.1)	0 (0.0)	1 (5.9)	0.392	0.464	0.333

[1]ASS: Administration and Services Staff; ***p value** ≤0.05.

DISCUSSION

This study assessed the prevalence of CVD risk factors by sociodemographic characteristics, including gender and occupational status at the University of Alicante. The highest

Many studies have determined that the risk for CVD is higher in men than in women throughout their lives[20,27,28]. It agrees with another study that evaluated the cardiovascular risk specifically in Spanish population[29]. However, while in our study the prevalence of having at least one risk factor (1 to 6) was also higher in men than in women, this difference was not statistically relevant.

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In addition, when comparing the job sector of a population to assess the CVD risk, a recent study found that working in public administration and defense was one of the top five job sectors with the highest prevalence for obesity, hypercholesterolemia and type 2 diabetes. They also found education to have one of the lowest prevalence for type 2 diabetes and hypercholesterolemia[16]. In our study, however, the obesity/overweight and hypercholesterolemia prevalence were higher in faculty than in ASS, but these differences were not statistically significant. Although faculty is included in the education job sector, this group has different working conditions than lower education grade institutions. Still, agreeing with the study cited above, the prevalence of waist circumference risk and type 2 diabetes were higher in ASS than in faculty.

In our study, the presence of three CVD risk factors was significantly higher in faculty than in ASS. It does not agree with the findings that people working in the administration sector usually have more CVD risk factors than education workers[16]. Nevertheless, ASS had a significantly higher prevalence for a sedentary lifestyle. Furthermore, for the presence of four risk factors, the prevalence was higher in ASS than in faculty, though this difference was not statistically relevant.

When comparing our results with one of the few studies that evaluated university workers, the prevalence of obesity is higher in our study (>80% vs. 25.5%)[16]. It could be explained by the age range studied of Hel, et al.[20], which was from 22 to 94 years old, incorporating more people outside of the age risk for CVD. They also reported a higher prevalence in men, agreeing with our results. Although we compare our findings with other studies, interpreting these comparisons must be done with caution. Different parameters were used in each study, including age ranges, clinical data categories, BMI-cut-off points, description of job sectors, education levels, etc.

The differences found by sex and occupational status contribute to demonstrate that the sample studied in this study is representative of the total Spanish university workers, where the number of male faculty workers is higher than the number of women[19]. The differences found between the occupational statuses are highly important to recognize the most vulnerable groups and to take preventive measures. Many factors could account for the differences found between faculty, ASS, and students, like stress levels, work hours, type of work, etc. More studies and with a large sample on this field are needed to better identify the causes behind the differences in the health status of the university community.

There are several limitations of the current study that point to potential areas for future research. Primarily, the data included in the present study were cross-sectional and, as a result, causation cannot be directly inferred. Secondly, the studied sample was relatively small in each occupational group (especially the students) and may have influenced the estimate of CVD risk. Moreover, there were a limited number of people older than 45 and 55 (men and women respectively) that attended the nutrition cabinet. For this reason, these data cannot be extrapolated to the entire university population, but results obtained can be considered of interest due to the lack of studies about CVD risk among university workers. Third, the prevalence of CVD risk factors could be higher in this group than in the general population since the people included were attending their first nutrition counseling session. In addition, the clinical data was self-reported based on previous medical diagnosis. Since the nutritional staff did not measure some of those parameters directly, more people could have had those diseases that were not declared, and therefore not considered in the results.

CONCLUSIONS

Our results showed differences in prevalence of CVD risk factors among students and workers at an age relevant to CVD risk. Although the results of this study are not representative of the entire university population, it may be of valuable insight for the university and other learning institutions on the necessity to promote a healthier lifestyle, not only for students but everybody that shares that environment. Further prospective, large scale studies and with a representative sample are needed to develop and validate novel potential preventive strategies.

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AUTHORS' CONTRIBUTIONS

Conceptualization, JAH, RO-M and AL; Methodology, IS and AN; Software, IS and AN; Validation, JMM-S and ML-C; Formal Analysis, ML-C and IS; Investigation, ML-C, JMM-S and AN; Resources, JAH, and AL; Data Curation, RO-M.; Writing – Original

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COMPETING INTERESTS

The authors report no conflict of interest.

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