# Prevalence of obesity and associated cardiovascular comorbidity in patients included in the IBERICAN study (Identification of the Spanish population at cardiovascular and renal risk).


## Abstract

**Objectives**. To analyze the prevalence of obesity and its association with other cardiovascular risk factors and cardiovascular disease in a sample of patients from the IBERICAN study.

**Material and methods**. Analysis of the inclusion visit of the first 5.013 patients enrolled in the IBERICAN study, longitudinal, observational, and multicenter study which is including individuals aged 18 to 85 years in primary care clinics in the different regions of Spain. In this work, obesity was defined as a body mass index ≥ 30 kg/m2.

**Results.** The prevalence of obesity was 35.7% (95%CI: 35.0% -36.4%), 36.6% men and 34.9% % women (p=0.214), increasing significantly with age (p<0.001). Obese patients presented, compared to non-obese patients, higher prevalence of arterial hypertension (62.8% vs 39.4%, p<0.001), dyslipidemia (56.9% vs 47.1%, p<0.001), sedentary lifestyle (40.6% vs 24.6%, p<0.001), diabetes mellitus (27.5% vs 14.8%, p<0.001), hyperuricemia (23.6% vs 12.7%, p<0.001), subclinical organ damage (33.7% vs 26.5%, p<0.001) and cardiovascular disease (21.2% vs 15.3%, p<0.001). The multivariate analysis showed that the variables associated with obesity were: arterial hypertension (p<0.001), hyperuricemia (p<0.001), sedentary lifestyle (p<0.001), diabetes mellitus (p<0.001), age (p<0.001), low level of education (p<0.001) and lower tobacco consumption (p<0.001).

**Conclusions** The analysis of the IBERICAN study shows that approximately one third of the analyzed population meet criteria for obesity, and cardiovascular risk factors, target organ damage and cardiovascular disease were more frequent in obese patients.


**Key words.** obesity, prevalence, cardiovascular risk factors

## Introduction

Cardiovascular disease (CVD) is the primary cause of morbidity and mortality in Spain and in our neighboring countries in Europe (1). The control of cardiovascular risk factors (CVRF) is the basis of primary disease prevention and plays a very important role in cardiovascular prognosis. It has been postulated that half of the decrease in coronary heart disease mortality rates is due to a better control of CVRF, such as arterial hypertension (AHT) or dyslipidemia (DL) (2). An early identification of patients with a higher cardiovascular risk (CVR) is therefore of utmost importance in order to implement preventive measures as soon as possible and thus maintain health and reduce the terrible socio-economic impact of CVD.

Among the different risk factors, obesity is experiencing a very rapid growth, especially among young population, and has become a serious Public Health problem worldwide, in such a way that it may be categorized as an epidemic instead of "risk factor" (3). In the last 30 years, the global prevalence of obesity has doubled (4); in Spain, more than half of the population are obese (21.6%) or overweight (39.3%), while the prevalence of abdominal obesity, which is more associated with CVR, reaches 33.4% (5).

The importance of obesity is defined not only for being a CVRF like AHT (6), DL (6) or type-2 diabetes (t2DM) (7), but also by its well-documented association with a poor control of these CVRF (6-8). The connection between obesity and diabetes is close and direct, since a weight loss of 1 kg reduces the incidence of t2DM by 16% (8). Moreover, obesity itself is an important risk factor for CVD, coronary heart disease, heart failure, atrial fibrillation, ventricular arrhythmia, and sudden death. In this regard, it has been found that more than two thirds of patients with coronary disease are overweight or obese (9).

However, despite all the information published about the contribution of the different risk factors to the development and progression of CVD, there is a lack of information about the comorbidity and prognosis of obese patients, in a wide range of ages, from different areas of Spanish Primary Care (PC).

The IBERICAN study (Identification of the Spanish population at cardiovascular and renal risk) is a comprehensive study, currently in its final stage of recruitment, that allows to assess different CVRF in the context of PC (10).

The aim of this analysis of the IBERICAN study was to determine the prevalence and the clinical and epidemiological characteristics of obese patients, as well as the CVRF associated with obesity.

## Material and methods

IBERICAN is a 5-year epidemiological, multicenter, observational, prospective study that is being carried out in Spanish PC on subjects attended in the National Health System, whose design and population characteristics have already been published (10). All the patients have signed the corresponding informed consent prior to their enrollment. The study was approved by the Clinical Research Ethics Committee of Hospital Clínico San Carlos of Madrid on 21 February 2013 (C.P. IBERICAN-C.I. 13/047-E) and is registered at *https://clinicaltrials.gov* with the number NCT02261441. The results presented in this article correspond to the cross-sectional analysis of the 5,063 patients who have completed the inclusion visit by 1 January 2017.

The definition of the variables has already been published in previous articles and is summarized in table 1 (10).

The qualitative variables have been defined as absolute and relative frequencies, and the continuous variables as mean ± standard deviation (median and interquartile range, where appropriate). The bivariate analysis has been conducted taking into account only the term of obesity, not abdominal obesity, by using the statistical tests corresponding to the nature of the variables; thus, categorical variables were analyzed using Chi-square (if more than 20% of cells had an expected frequency lower than 5, a Fisher's exact test was used), and continuous variables were analyzed by Student's t-test. P-values <0.001 were considered statistically significant.

A multivariate analysis was carried out using logistic regression by backward Wald method introducing all the qualitative variables that showed relation to obesity in the bivariate analysis: sex, age (as a qualitative variable), race, habitat, educational level, economic level, employment situation, sedentary lifestyle, smoking, AHT, DL, t2DM, hyperuricemia, and cardiovascular family history.

In all comparisons the null hypothesis was rejected with an alpha error < 0.05.

The program IBM SPSS (Statistical Package for Social Sciences) for Windows was used for the data analysis (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, version 22.0.0.0. Armonk, NY: IBM Corp).

## Results

### Descriptive data of the sample

Of all 5,063 patients, 50 were rejected (0.9%) due to failure to comply with the protocol or to incomplete data. Hence, the final sample of this analysis was 5,013 patients (55.1% women), with an average age (SD) of 57.6 ±14.8 years. 54.7% of patients came from an urban area, 25.1% from a semi-urban area, and 20.2% from a rural area. The average BMI was 29.6 ±8.9 kg/$m^2$ and the average waist circumference was 96.0 ±14.4 cm. The prevalence of dyslipidemia was 50.5%, of AHT was 47.8%, and of diabetes was 19.3%. Regarding lifestyle, 30.3% admitted having a sedentary lifestyle, 18.1% were active smokers, and 13.3% admitted consumption of harmful (excessive) amounts of alcohol.

### Prevalence of obesity

35.7% (95%CI: 35.0%-36.4%) of the study population presented obesity, without difference between the sexes: 36.6% (35.9%-37.3%) in men and 34.9% (34.2%-35.6%) in women, p=0.214. Additionally, 31.2% of obese patients also presented an increased waist circumference. In relation to the intervals established by the SEEDO (Spanish Association for the Study of Obesity) (11) the prevalences were: 0.6% were underweight, 23.8% normal weight, 15.8% grade I overweight and 24.1% grade II overweight; as for degrees of obesity, 23.4% presented class I obesity, 7.1% class II, 2.4% class III (morbid), and 2.7% class IV (extreme).

### Characteristics of obese individuals

Tables 2 and 3 show the characteristics of subjects with and without obesity, by sex. Among the principal epidemiological data of the sample (table 2) we can highlight a similar distribution of women in both groups with and without obesity (53.9% vs 55.7%, p=0.214), and older age in obese patients (60.2±13.4 years vs 56.2±15.4 years, p<0.001). There was a higher percentage of obese patients in rural areas (23.2% vs 18.8%, p<0.001) and a larger number of uneducated individuals (13.8% vs 7.7%) or with primary education (62.1% vs 52.6%) (p<0.001) among obese patients. Similarly, a higher prevalence of obesity was observed in patients with an annual income lower than 18,000€ (50.1% vs 42.6%, p<0.001). Finally, the prevalence of obesity was lower in actively employed patients (36.2% vs 46.0%, p<0.001).

### Clinical and biochemical variables of interest

The analysis of the physical examination and blood test parameters are shown in table 3. The group of obese patients presented higher systolic (133±15.7 vs 126.9±15.7, p<0.001) and diastolic (79.1±10.3 vs 75.5±10.1, p<0.001) blood pressure readings than non-obese subjects. Glycemia levels were higher (108.4±31.5 vs 98.3±25.2, p<0.001) and LDL-cholesterol levels were lower (115.9±36.1 vs 119.3±35.2, p=0.002) in obese patients as compared to the non-obese.

**Coexistence of cardiovascular risk factors**

The obese population showed a greater coexistence of other CVRF as compared with non-obese patients (table 2). The most prevalent CVRF in obese subjects were, in order of frequency: AHT (62.8%), DL (56.9%), sedentary lifestyle (40.6%), t2DM (27.5%), family history of early CVD (18.3%), and smoking (14.7%). We also analyzed the simultaneous association of AHT, t2DM and DL in the same individual, finding that it was more frequent in obese patients (18.1% vs 8.1%, p<0.001).

**CVRF control and drug treatment**

No significant differences were observed in the degree of control of t2DM and DL, but there were in AHT, which was more poorly controlled also in obese patients and in men (table 2). The analysis of the simultaneous presence of the three CVRF showed a similar percentage of patients who did not have any of them controlled (9.7% vs 8.3%, p=0.319) or had the three of them within control targets (14.4% vs 19.0%, p=0.319). The use of antihypertensive drugs was larger in obese patients (1.9±0.03 vs 1.6±0.02, p<0.001), with a larger number of patients who received drug treatment (94.7% vs 93.3%, p<0.001) and who used 3 or more antihypertensive drugs (25.5% vs 15.9%, p<0.001). The number of obese patients with hypolipidemic drug treatment was larger (77.4% vs 70.3%, p<0.001), and in general, they took a greater number of drugs (0.8±0.02 vs 0.7±0.01, p<0.001). No differences were observed in the number of patients who received medication for t2DM (92.1% vs 87.8%, p=0.324) or in the number of hypoglycemic drugs used (1.6±0.04 vs 1.5±0.04, p=0.063). As regards cardiovascular drugs, obese subjects received more anticoagulants (7.3% vs 3.9%, p<0.001) and more antiplatelet agents (19.0% vs 12.0%, p<0.001).

**Subclinical organ damage and cardiovascular disease**

The occurrence of subclinical organ damage (SOD) was in general more frequent in obese patients (33.7% vs 26.5%, p<0.001), as well as each of the lesions individually, except the ankle-brachial index (ABI), that did not show statistically significant differences. In order of frequency, the most common in obese patients were elevated pulse pressure in patients over 65 years of age (20.3%) and albuminuria (13.4%), Figure 1.

21.2% of obese subjects presented a history of CVD, as against 15.3% of the non-obese (p<0.001). The most common CVD were ischemic heart disease (9.1%) and peripheral arterial disease (6.5%). All the CVD analyzed were more frequent in obese patients, except retinopathy (Figure 2). Atrial fibrillation showed a higher prevalence in obese subjects (7.2% vs 4.5%, p<0.001).

Concerning kidney function, obese patients presented lower estimated glomerular filtration rates (86.6±20.0 ml/min vs 89.3±20.4 ml/min, p<0.001) and higher albuminuria (26.4±106.2 mg/g vs 16.3±61.3 mg/g, p<0.001). An analysis was also made of the prevalence of glomerular filtration rate decline, which was higher in obese patients (11.4% vs 8.7%, p<0.001), and its possible association with albuminuria, Table 1, confirming that both, in isolation or co-occurring, were more frequent in obese patients, p<0.001.

The estimated CVR was higher in obese patients, with a higher prevalence of patients with very high (41.5% vs 30.8%, p<0.001) and high CVR (18.0% vs 13.5%, p<0.001), and lower prevalence of moderate CVR (26.7% vs 35.7%, p<0.001) or low CVR (13.8% vs 20.0%, p<0.001).

**Multivariate analysis**

The multivariate analysis showed that the variables associated with a higher prevalence of obesity were: AHT (OR: 2.059; 95%CI: 1.743-2.432), hyperuricemia (OR: 1.871; 95%CI: 1.549-2.260), sedentary lifestyle (OR: 1.851; 95%CI: 1.549-2.260), t2DM (OR: 1.456; 95%CI: 1.215-1.746), younger age (OR: 0.990; 95%CI: 0.985-0.996), and low level of education (OR: 0.736; 95%CI: 0.605-0.895) (table 4).

## Discussion

According to the data generated by the IBERICAN study to date, the prevalence of obesity in a broad sample of patients recruited in the different Spanish regions is alarming, reaching 35.7%. Obesity is particularly present in the over-65 age range, both men and women. Another finding of crucial importance is the increased co-occurrence of CVRF, SOD and CVD in the analyzed population.

The study includes a homogeneous sample, with sociodemographic and clinical characteristics which are very similar to those of other studies (5; 12; 13), but more consistent due to the larger sample size and the design in line with the study objective, which reflects the population that comes to the PC health centers in Spain, with a slight predominance of women, who are more frequently overweight.

The prevalence of obesity in this study is higher than that obtained in population-based studies carried out in Spain, and similar to that reported by clinical trials. This upward trend seems, unfortunately, temporal and continuous according to the analysis of previous similar studies. The DORICA study, of 1990, described a prevalence of obesity of 13%-18% (12), a much higher incidence was observed in 2010 with data from the ENRICA (22.9%) (14) and DARIOS (29%) (13) studies, whereas the recent ENPE study showed a prevalence of 21.6% in population aged 25-64 (5). Our study has obtained a prevalence of 35.7%; this finding may be due to the older age of our population and thus the well-known association between age and obesity. In any case, it should be emphasized that the progressive increase of obesity affects not only Spain, but unfortunately it is a widespread pattern which affects all western countries (4).

The connection of obesity with different CVRF is a known fact. Thus, in the Di@bet.es study, which included data from the region of Andalucía only, a higher prevalence of AHT, dyslipidemia and t2DM (43.9%, 50.3% and 16.3%, respectively) was observed; its authors connected this with a higher prevalence of obesity in the sample (37.0%) (15). This association between obesity and the coexistence of the three CVRF has been confirmed in our multivariate analysis and is consistent with what other authors have expounded (16). This observation is of utmost importance given the synergy effect that the association of various CVRF has on the genesis and progression of CVD (17). Regarding the degree of control of CVRF, contrary to expectations, there were no large differences between obese and non-obese patients, with the exception of hypertension (16).

The importance of obesity and its combination with other CVRF has a two-fold perspective: on the one hand, its consequences in the presence of other CVRF, as just discussed, but on the other hand, its possible causes should be analyzed and understood to be able to prevent it. The variable that seems most important and whose influence is commonly observed in the presence of all CVRF as well as CVD is age. We therefore observe a higher prevalence of obesity in patients over 40 years of age as opposed to younger population, aged 18-40, but reaching a much higher prevalence in intermediate age groups (40-65 years), fact that is confirmed in other studies that show a higher prevalence in older patients but also increasing in younger patients (13; 18). These observations must be taken into account for the development of diabetes in adulthood and should serve as a warning call from a preventive point of view, given the well-known prognostic value of early obesity in developing diabetes in adulthood, and of diabetes in the progression of CVD. Therefore, we must emphasize the need of implementing preventive and/or therapeutic measures even in pre-symptomatic stages before the manifestation of CVD (19).

In addition to the association between obesity and other CVRF, we should bear in mind that, even though a poorer control of those CVRF might be expected, this study did not show any differences, except for AHT. The fact that may explain these results is that the drug treatment for the three CVRF analyzed was more frequent and with a larger number of drugs, which may improve control, but at a higher cost.

Another aspect that has been connected with obesity is socio-economic level. In IBERICAN it has been observed that patients from lower social class and educational level present higher rates of obesity. This has already been noted in both population-based (5; 15) and community-based (20) studies from our environment. Among the etiological hypotheses that may explain this association are environmental pollutants or emotional stimuli, but also a lower economic level and unhealthy living habits (21), since foods high in fats certainly increase the feeling of satiety and are more economical.

Despite all the hypotheses put forward and the variables that may be connected with obesity, its increase seems to be directly associated with unhealthier ways of life, particularly as regards diet and sedentary lifestyle. As shown in this study's results, obese patients have a higher rate of sedentary lifestyle, and the combination of both factors may act jointly in the genesis of other CVRF, such as hyperlipidemia, diabetes, etc. (22). In the analysis of CVR, the presence of SOD certainly increases this risk considerably. In the case of SOD, there are no studies that analyze its prognostic values jointly, so the results that IBERICAN will generate in this regard will be novel and very valuable for clinical practice given the importance of the interventions carried out on this group of patients.

Furthermore, the observed CVD prevalence of 21.2% agrees with other studies, such as PRESCAP 2010, with a prevalence for CVD of 28.2% in hypertensive patients (23). Likewise, the prevalence of ischemic heart disease (9.1%) or peripheral arterial disease (6.5%) coincide with the di@bet.es study, with prevalences of 11.3% and 3.5%, respectively (15).

The multivariate analysis performed on our sample confirms the association between obesity and the classic CVRF, such as AHT, t2DM, dyslipidemia and hyperuricemia. This goes along with what other authors have laid out (16). Old age, as well as smoking, acts as a protective factor, possibly because it describes patients with a higher prevalence of CVD and therefore higher cardiovascular risk, who have lost weight thanks to treatment or who have died, and which may be due to the cross-sectional design of this study.

The limitations of this study are those characteristic of any observational study where physicians and patients are not randomized and, therefore, a cause-and-effect relationship cannot be established between the associations found. With respect to data collection, it should be noted that probably the most motivated physician researchers have participated; this is certainly only reflected in a probable better control of CVRF, which leave great room for improvement. On the other hand, some variables were measured only once (weight, height, waist circumference) with the technique available at the doctor's office (not validated for all researchers), and the results of the blood tests had not been centrally determined; in any case, this reflects the situation in routine clinical practice, which is the context of clinical decision making. It must also be taken into account that this study has analyzed age as a categorical variable in order to synthesize better the analyses and results presented because, although it may cause bias, it produces the same results as other studies, as has been said. Finally, another source of reporting bias may be the use of the clinical interview to ascertain tobacco use, alcohol use and physical activity. However, especially in the case of sedentary lifestyle, we have observed biologically plausible results that agree with the existing literature, so the bias does not seem to have influence on the results of our study.

The analyzed sample size with more than 5,000 patients, the consecutive patient selection, and the methodology of the analyses performed gives strength to the study, whose results can be considered to be reasonably representative of this group of patients attended in PC.

In conclusion, it is observed in the IBERICAN study that approximately one third of patients attended in PC are obese, predominantly in elderly patients, rural areas, low level of education and lower purchasing power. The higher prevalence of CVRF, SOD and CVD in obese patients conditions a higher CVR and also makes it necessary to intensify the drug treatment in obese patients even at asymptomatic stages in order to reduce the incidence of cardiovascular morbidity and mortality.

Finally, although results derive from a cross-sectional analysis of the IBERICAN cohort, the data collected and the size of the analyzed population make it one of the most comprehensive studies carried out so far in Spain. Furthermore, our results seem to indicate that there has been, compared to previous surveys, an increase in the prevalence of obesity, so further research and action in this direction is essential to achieve a better understanding of the situation of obesity in Spain and to be able to take the necessary corrective measures. Undoubtedly, the analyses of the follow-up of patients included in the IBERICAN study will provide relevant information about the projection of obesity in Spain.

**Table 1. Definition of the variables of the IBERICAN study**

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| **Arterial hypertension (AHT)** | Patients diagnosed with AHT, or taking antihypertensive medication, were considered hypertensive. Blood pressure was measured in sitting position, after 5 minutes of rest, obtaining the mean of two determinations, according to current European recommendations.<br><br>AHT control was considered poor when blood pressure values were >140/90mmHg, in general; >150/90 mmHg, in patients over 80 years of age; >140/85 mmHg, in diabetic patients; and >130/90 mmHg, in patients with kidney disease and proteinuria. |
| **Diabetes Mellitus (DM)** | Patients diagnosed with diabetes or taking antidiabetic medication were considered diabetic.<br><br>Adequate control has been defined individually as HbA1c < 7% in patients aged ≤75 years, without cardiovascular disease; HbA1c < 8% in patients aged ≤65 years, with cardiovascular disease; HbA1c < 8.5% in patients aged 65 to 75 with cardiovascular disease, and in patients aged >75 years with or without cardiovascular disease. |
| **Dyslipidemia** | Patients were considered to have dyslipidemia if they had been diagnosed with it, or were taking lipid lowering medication, or their blood tests showed increased lipid concentrations according to the patient's cardiovascular risk: total cholesterol ≥200mg/dl, LDL ≥130mg/dl, HDL <40mg/dl in men or <50mg/dl in women, or triglycerides ≥200mg/dl, for patients with normal Cardiovascular Risk; or total cholesterol ≥175mg/dl, LDL ≥100mg/dl, HDL <40 mg/dl in men or <46mg/dl in women, or triglycerides ≥150mg/dl, for patients with high Cardiovascular Risk. |
| **Obesity** | Obesity was defined as a body mass index (BMI) ≥30 $kg/m^2$, measuring weight and height in the inclusion visit. |
| **Abdominal obesity** | It was defined as increased waist circumference (≥102 cm in men and ≥88 cm in women) measured at the mid-point between the iliac crest and the rib cage. |
| **Metabolic syndrome (MetS)** | According to the harmonized definition of the international consensus which requires the presence of three of the following five criteria: a) elevated fasting glycemia level (≥100 mg/dl) or receiving antidiabetic treatment with insulin or oral antidiabetic drugs; b) elevated systolic blood pressure ≥130 mmHg or diastolic ≥85 mmHg, or receiving antihypertensive drug treatment; c) HDL-C values < 40 mg/dl (men) or < 50 mg/dl (women); d) triglycerides ≥150 mg/dl; and e) waist circumference ≥102 cm (men) or ≥88 cm (women) |
| **Premorbid metabolic syndrome (PMetS)** | It was defined in patients with MetS, excluding those participants who had DM (previously diagnosed or presenting fasting glycemia levels ≥126 mg/dl) or had a history of CVD (accepted as previously diagnosed in those who reported having had acute myocardial infarction, angina or stroke). |
| **Sedentary lifestyle** | Moderate/low exercise was defined as physical activity of less than 30-min moderate-intensity daily walk for at least 4 days, according to the information obtained during history taking. |
| **Smoking** | It was assessed in a clinical interview, defining as smoker those who used tobacco (at least one cigarette, cigar, pipe) during the month prior to inclusion in the protocol, and defining as ex-smoker those who had not smoked in the last year. |

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| **Alcoholism** | Also assessed in a clinical interview, it was suspected when the intake per day was more than 4 units in men (40g) and 3 units in women (30g). |
| **Cardiovascular disease** | Patients were considered to have ischemic heart disease if a history or diagnosis of angina, acute myocardial infarction or some type of coronary revascularization was documented in their clinical record.<br><br>Patients were considered to have heart failure if recorded in the medical history.<br><br>Cerebrovascular disease (CVD) was considered when the clinical record presented a history or diagnosis of hemorrhagic stroke, ischemic stroke, transient ischemic attack (TIA), carotid stenosis, or carotid artery surgery due to atherosclerosis.<br><br>Patients were considered to have peripheral arterial disease (PAD) when the ankle-brachial index measured by the researcher was <0.9 in at least one member, or when their clinical record included a history of PAD or of some type of arterial revascularization surgery in the lower extremities. |
| **Nephropathy** | The urinary protein excretion was defined as albuminuria (30-300 mg/24h) or proteinuria (>300 mg/24h).<br><br>The glomerular filtration rate was estimated using the CKD-EPI formula. On this basis, occult renal disease was also defined as eGFR < 60 ml/min/1.73m$^2$ and normal creatinine levels, and chronic kidney disease as eGFR < 60 ml/min/1.73m$^2$ and elevated creatinine (> 1.2 mg/dl in women or > 1.3 mg/dl in men). |
| **Subclinical Organ Damage** | The parameters measured were: left ventricular hypertrophy (LVH) was determined according to the information provided by the researcher, the diagnosis of which could be established using electrocardiogram (Sokolow-Lyon index >3.5 mV, RaVL > 1.1 mV, Cornell voltage product > 244 mV*ms), and /or echocardiogram (>115 g/m2, in men; >95 g/m2, in women); microalbuminuria; pathological ABI (values < 0.9); and pulse pressure > 60 mmHg in patients older than 65 years. |
| **Cardiovascular Risk** | Cardiovascular risk stratification of patients was carried out following the SCORE charts for low-risk countries. |

**Table 2. Age groups and risk factors, and connection with the presence of obesity, and by sex**

| | Obese | | | | Non obese | | | | p** |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Men | Women | p* | Total | Men | Women | p* | |
| **Age** | 60,2±13,4 | 60,1 ± 0,5 | 60,3 ± 0,4 | 0,715 | 56,2±15,4 | 57,7 ± 0,4 | 55,1 ± 0,4 | <0,001 | <0,001 |
| **18-40 years** | 7,6 (7,2-8,0) | 6,3 (6,0-6,6) | 8,8 (8,4-9,2) | <0,001 | 15,8 (15,3-16,3) | 13,1 (12,6-13,6) | 18,0 (17,5-18,5) | <0,001 | <0,001 |
| **40-65 years** | 50,6 (49,9-51,3) | 54,0 (53,3-54,7) | 47,6 (46,9-48,3) | 0,038 | 51,4 (50,7-52,1) | 50,9 (50,2-51,6) | 51,8 (51,1-52,5) | 0,161 | 0,569 |
| **≥65 years** | 41,8 (41,1-42,5) | 39,7 (39,0-40,4) | 43,7 (43,0-44,4) | 0,045 | 32,8 (32,1-33,5) | 36,0 (35,3-36,7) | 30,3 (29,6-31,0) | <0,001 | <0,001 |
| **>80 years** | 5,7 (5,4-6,0) | 6,2 (5,9-6,5) | 5,3 (5,0-5,6) | 0,454 | 4,9 (4,6-5,2) | 6,4 (6,1-6,7) | 3,7 (3,4-4,0) | 0,037 | 0,134 |
| **AHT** | 62,8 (62,1-63,5) | 65,3 (64,6-66,0) | 60,7 (60,0-61,4) | <0,001 | 39,4 (38,7-40,1) | 45,0 (44,3-45,7) | 34,9 (34,2-35,6) | 0,014 | <0,001 |
| **Controled AHT** | 52,1 (51,0-53,0) | 48,3 (47,3-49,3) | 55,5 (54,5-56,5) | <0,001 | 61,3 (60,3-62,3) | 60,6 (59,6-61,6) | 62,0 (61,0-63,0) | 0,024 | <0,001 |
| **Dyslipidemia** | 57,0 (56,3-57,7) | 58,5 (57,8-59,2) | 55,6 (54,9-56,3) | <0,001 | 47,1 (46,4-47,8) | 50,1 (49,4-50,8) | 44,7 (44,0-45,4) | <0,001 | <0,001 |
| **Controled dyslipidemia** | 34,0 (33,3-34,7) | 36,0 (35,3-36,7) | 32,4 (31,7-33,1) | 0,459 | 36,7 (36,0-37,4) | 35,6 (34,9-36,3) | 37,6 (36,9-38,3) | 0,005 | 0,038 |
| **t2DM** | 27,5 (26,9-28,1) | 32,1 (31,4-32,8) | 23,6 (23,0-24,2) | <0,001 | 14,8 (14,3-15,3) | 19,1 (18,5-19,7) | 11,3 (10,8-11,8) | <0,001 | <0,001 |
| **Controled t2DM** | 68,4 (66,9-69,9) | 68,9 (67,4-70,4) | 67,7 (66,2-69,2) | 0,149 | 71,6 (70,1-73,1) | 73,4 (72,0-74,8) | 69,2 (67,7-70,7) | 0,414 | 0,154 |
| **Hyperuricemia** | 23,6 (22,9-24,3) | 25,2 (24,5-25,9) | 22,2 (21,6-22,8) | <0,001 | 12,7 (12,2-13,2) | 15,4 (14,8-16,0) | 10,5 (10,0-11,0) | <0,001 | <0,001 |
| **Family history of CVD** | 18,3 (17,7-18,9) | 16,9 (16,3-17,5) | 19,5 (18,9-20,1) | 0,115 | 15,4 (14,8-16,0) | 14,7 (14,2-15,2) | 16,0 (15,4-16,6) | 0,019 | 0,009 |
| **Sedentary lifestyle** | 40,6 (39,9-41,3) | 36,0 (35,3-36,7) | 44,5 (43,8-45,2) | <0,001 | 24,6 (24,0-25,2) | 20,8 (20,2-21,4) | 27,7 (27,1-28,3) | <0,001 | <0,001 |

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|---|---|---|---|---|---|---|---|---|---|
| **Smoking** | 14,7 (14,2-15,2) | 18,6 (18,0-19,2) | 11,3 (10,8-11,8) | 0,005 | 19,8 (19,2-20,4) | 22,7 (22,1-23,3) | 17,5 (17,0-18,0) | <0,001 | <0,001 |
| **eGFR <60ml/min** | 11,4 (11,0-11,8) | 8,8 (8,4-9,2) | 13,7 (13,2-14,2) | 0,001 | 8,7 (8,3-9,1) | 7,7 (7,3-8,1) | 9,4 (9,0-9,8) | 0,104 | 0,001 |

AHT: arterial hypertension; DL: dyslipidemia; t2DM: type 2 diabetes mellitus; CVD: cardiovascular disease. Qualitative variables are expressed as a percentage (%) and their confidence interval at 95%. p*: level of significance between sexes; p**: level of significance between obese and non-obese

**Table 3. Clinical variables and risk factors with the presence of obesity and by sex**

| | Obese | | | | Non obese | | | | p** |
|---|---|---|---|---|---|---|---|---|---|
| | **Total** | **Men** | **Women** | **p*** | **Total** | **Men** | **Women** | **p*** | |
| **Weight (Kg)** | 89,1 ± 15,2 | 95,7 ± 0,5 | 83,4 ± 0,5 | <0,001 | 69,6 ± 11,1 | 76,8 ± 0,2 | 63,9 ± 0,2 | <0,001 | <0,001 |
| **Height (m)** | 1,6 ± 0,8 | 1,6 ± 0,1 | 1,5 ± 0,1 | <0,001 | 1,6 ± 0,1 | 1,7 ± 0,1 | 1,6 ± 0,1 | <0,001 | <0,001 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Waist circunference (cm)** | 106,8 ± 12,3 | 110,3 ± 0,4 | 103,8 ± 0,4 | <0,001 | 90,0 ± 11,7 | 94,7 ± 0,3 | 86,2 ± 0,3 | <0,001 | <0,001 |
| **BMI (Kg/m2)** | 36,8 ± 11,4 | 36,5 ± 0,4 | 37,0 ± 0,3 | 0,352 | 25,7 ± 2,8 | 26,3 ± 0,1 | 25,2 ± 0,1 | <0,001 | <0,001 |
| **SBP (mmHg)** | 133,2 ± 15,7 | 135,2 ± 0,5 | 131,5 ± 0,5 | <0,001 | 126,9 ± 15,7 | 129,9 ± 0,4 | 124,5 ± 0,4 | <0,001 | <0,001 |
| **DBP (mmHg)** | 79,1 ± 10,3 | 80,4 ± 0,4 | 77,9 ± 0,3 | <0,001 | 75,5 ± 10,1 | 76,8 ± 0,3 | 74,4 ± 0,2 | <0,001 | <0,001 |
| **PP (mmHg)** | 54,1 ± 13,2 | 54,7 ± 0,4 | 53,6 ± 0,4 | 0,078 | 51,6 ± 12,7 | 53,4 ± 0,3 | 50,2 ± 0,3 | <0,001 | <0,001 |
| **HR (lpm)** | 74,4 ± 10,9 | 73,3 ± 0,4 | 75,4 ± 0,3 | <0,001 | 72,8 ± 10,7 | 71,5 ± 0,3 | 73,8 ± 0,2 | <0,001 | <0,001 |
| **Total cholesterol (mg/dL)** | 193 ± 40,2 | 186,0 ± 1,4 | 199,1 ± 1,3 | <0,001 | 197,3 ± 39,1 | 192,1 ± 1,1 | 201,5 ± 0,9 | <0,001 | <0,001 |
| **HDL cholesterol (mg/dL)** | 51,6 ± 14,3 | 46,8 ± 0,4 | 55,6 ± 0,5 | <0,001 | 56,7 ± 15,6 | 50,8 ± 0,4 | 61,3 ± 0,4 | <0,001 | <0,001 |
| **Non HDL cholesterol (mg/dl)** | 141,7 ± 39,0 | 139,1 ± 1,4 | 144,0 ± 1,3 | 0,009 | 141,4 ± 38,1 | 141,8 ± 1,1 | 140,9 ± 0,9 | 0,532 | 0,739 |
| **LDL cholesterol (mg/dL)** | 115,9 ± 36,1 | 112,1 ± 1,4 | 119,2 ± 1,2 | <0,001 | 119,3 ± 35,2 | 117,4 ± 1,1 | 120,8 ± 0,8 | 0,010 | 0,002 |
| **Triglycerides (mg/dL) Median (p25-p75)** | 138,2 ± 84,1 | 149,5 ± 3,6 | 128,5 ± 2,1 | <0,001 | 118,0 ± 83,1 | 131,7 ± 2,7 | 107,0 ± 1,5 | <0,001 | <0,001 |
| **Glycemia (mg/dL)** | 108,4 ± 31,5 | 112,5 ± 1,2 | 104,9 ± 0,9 | <0,001 | 98,3 ± 25,2 | 102,7 ± 0,8 | 94,7 ± 0,5 | <0,001 | <0,001 |
| **HbA1c (%)** | 7,1 ± 1,4 | 7,0 ± 0,1 | 7,2 ± 0,1 | 0,103 | 7,0 ± 1,2 | 6,9 ± 0,1 | 7,1 ± 0,1 | 0,284 | 0,286 |
| **Uric acid** | 5,7 ± 1,5 | 6,2 ± 0,1 | 5,2 ± 0,1 | <0,001 | 5,1 ± 1,4 | 5,8 ± 0,1 | 4,5 ± 0,1 | <0,001 | <0,001 |

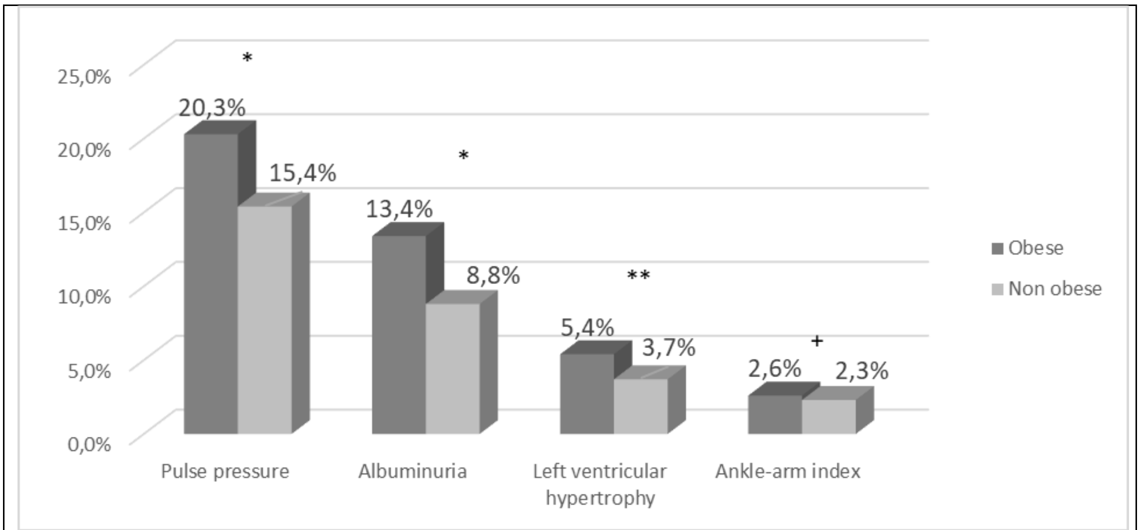
IMCBMI: Body mass index; SBP: systolic blood pressure; DPB: diastolic blood pressure; PP: pulse pressure; mmHg: millimeters of mercury; HR: heart rate; bpm: beats per minute; HDL cholesterol: high-density lipoprotein cholesterol; LDL cholesterol: low-density lipoprotein cholesterol; HbA1c: glycated hemoglobin. Quantitative variables expressed in mean±standard deviation. p*: level of significance between sexes; p**: level of significance between obese and non-obese.

**Table 4. Multivariate analysis for obesity**

| Variable | Coeficiente | OR | IC95% | p |
|---|---|---|---|---|
| Hypertension | 0,722 | 2,059 | 1,743 – 2,432 | <0,001 |
| Hyperuricemia | 0,626 | 1,871 | 1,549 – 2,260 | <0,001 |
| Sedentary lifestyle | 0,616 | 1,851 | 1,549 – 2,260 | <0,001 |
| Diabetes | 0,376 | 1,456 | 1,215 – 1,746 | <0,001 |
| Age | 0,274 | 0,990 | 0,985 – 0,996 | <0,001 |
| Leve lof education | -0,335 | 0,716 | 0,650 – 0,788 | <0,001 |
| Smoking | -0,307 | 0,736 | 0,605– 0,895 | <0,001 |

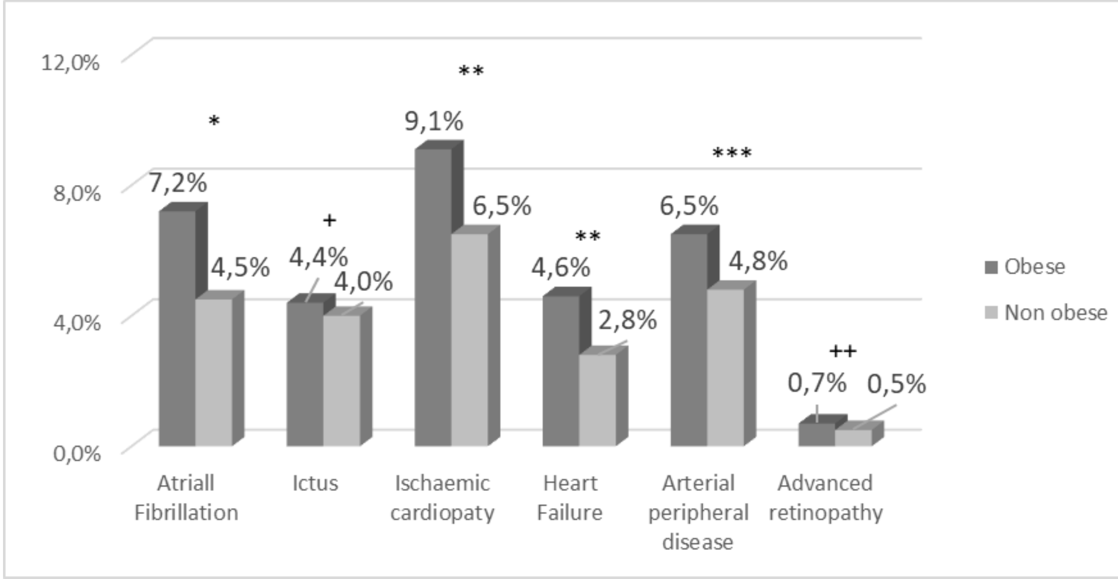
Multivariate logistic regression, backward stepwise method..

**Figure 1. Prevalence of subclinic organ damage in obese vs non obese**




*: p<0,001; **: p=0,007; +: p=0,449

**Figure 2. Prevalence of cardiovascular disease in obese vs non obese**




*: p<0,001; +: p=0,437; **: p=0,001; ***: p=0,012; ++: p=0,341