**Association Between Lifestyle and Systemic Arterial Hypertension in Young Adults: A National, Survey-Based, Cross-Sectional Study**

# Association between lifestyle and systemic arterial hypertension in young adults: a national, survey-based, cross-sectional study.

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## Abstract

**Introduction:** The prevalence of systemic arterial hypertension in young adults is increasing worldwide in association with modifiable risk factors.

**Aim**: to assess the prevalence of high blood pressure (BP) in young adults participating to a screening campaign during the World Hypertension Day (17/05/2014), and to determine the possible association with lifestyle factors.

**Methods:** 493 individuals aged 18-35 years were selected in 13 Italian cities. All participants underwent BP measurement together with the administration of a questionnaire exploring: medical and drug history; traditional cardiovascular risk factors and diseases; dietary pattern; salt intake; sleep habits; mood disorders.

**Results:** High BP (≥140/90 mmHg) was found in 54 individuals, with a prevalence of 11% and awareness of 28%. Those with high BP values were more frequently men, reported a higher BMI and a greater use of corticosteroids and non-steroidal anti-inflammatory drugs, and had a lower anxiety score. Concerning dietary habits, they were more likely to eat cheese /cold cuts ≥3 times/week, to have their meals out ≥1/day and to eat in fast foods ≥1/week. In the multiple logistic regression analysis, male sex [OR 3.19, 95%CI(1.33-7.63)], BMI [OR 1.14 95%CI(1.04-1.25)], eating in fast foods [OR 3.10 95%CI(1.21-7.95)], and anxiety [OR 0.85 95%CI(0.75-0.97)], were independently associated with high BP.

**Conclusions:** High BP values were found in 11% young adults. Male sex, adiposity and alimentary habits were the main determinants of high BP values, indicating that young men are a suitable target for healthy lifestyle interventions.

## INTRODUCTION

High blood pressure (BP) is the single biggest contributor to the global disease and mortality burden, leading to 9,4 millions of deaths each year [1]. Being tightly connected to the prevalence of modifiable risk factors, the majority of these deaths could be prevented by prompting a healthier lifestyle [2]. In contrast, the prevalence of systemic arterial hypertension continues to rise, especially in young adults [3]: in the United States it has reached 19% in 2008 in the 24-32 age group, according to the Add Health study [4]. More worryingly, even amongst the younger hypertension still remains under-diagnosed and undertreated [5-7]. In study conducted by general practitioners, a diagnosis of hypertension was made only in half individuals aged 18-24 years with high BP values [8]. Furthermore, young adults have consistently lower prevalence of hypertension control compared with middle-aged (40–59 years) and older (≥60 years) individuals [9]. Medical inertia towards hypertension in young adults might increase cumulative BP exposure, leading to early cardiovascular complication and myocardial dysfunction in middle age [10].

There is paucity of data regarding hypertension prevalence and determinants in young adults in Italy: large European surveys, with Italy among the countries involved, included individuals older than 35 years [11], patients in secondary prevention [12]or with established hypertension [13]. The Hypertension and Ambulatory Recording Venetia Study (Harvest) selected about 1,000 patients with established hypertension or borderline BP values, aged 18-45 years old, and gave a crucial insight about clinical characteristics of hypertension in young adults[14]; however hypertension prevalence and determinants in young adults in Italy is still unknown [6].

Diet, among the other environmental factors related to hypertension, is likely to play the predominant role in blood pressure homeostasis. Reduced salt intake, weight loss, and moderation of alcohol consumption are established dietary modifications that lower BP [15], but also increased potassium intake and consumption of dietary patterns based on the Dietary Approaches to Stop Hypertension (DASH) diet can prove beneficial [16]. However, a secular trend towards a decreased diet quality has been described over the past three decades, with the lowest scores observed in the young adults [17]. For example, a recent observational cross-sectional study showed an increased prevalence of hypertension among consumers of street food [18].

Other emerging, modifiable risk factors might also play a major role in the increased hypertension prevalence in young adults. For instance, sleep, and more specifically sleep loss, has been frequently associated with the development of hypertension, especially in individuals <60 years old

[19]. A recent study found that, after controlling for confounders, insomnia combined with physiological hyper-arousal increased the odds of hypertension by 300% [20], though conflicting data exist [21]. Mood disorders have also been linked with cardiovascular diseases and hypertension may well be the intermediary link [22]. Although Bosworth *et al* [23] found an association between elevated cardiovascular reactivity during stress and the development of hypertension, other authors had not confirmed this hypothesis [24].

Thus, there is a strong need to understand the importance of these novel potential risk factors for hypertension in large-scale population cohort studies involving young adults; should their causative role be confirmed, specific measure will be required to halt the diffusion of arterial hypertension and cardiovascular diseases [6]. To the best of our knowledge, no studies are available on the prevalence and determinants of hypertension in young adults in Italy.

The aims of this study were: to investigate the prevalence of arterial hypertension in a nationwide sample of individuals aged between 18 and 35 years recruited in a multicentre study; to explore the association between hypertension and both traditional and emerging risk factors, with particular attention to lifestyle.

## METHODS

### Study population

The study was performed during the World Hypertension Day (WHD, 17/05/2014), a global initiative supported by the International Society of Hypertension (ISH) and World Hypertension League (WHL) and locally promoted by the Italian Society of Hypertension (Società Italiana dell'Ipertensione Arteriosa – SIIA). Citizens approaching to the stalls, set up on purpose in city squares, public hospitals and other places of interest, were provided with leaflets and given information about hypertension and cardiovascular risk factors and were offered a free consultation by an Hypertension specialist and blood pressure measurement. Individuals aged 18-35 years were asked to join in the survey. Inclusion criteria were: age between 18 and 35 years; signed informed consent. Exclusion criteria were: inability to complete the survey; missing BP values.

### Measurements

The individuals aged 18-35 years conforming inclusion/exclusion criteria and accepting to participate in the survey were asked to fill in a short (about 10-min long) self-administered questionnaire including demographic and anthropometric data such as age, sex, self-reported body weight and height, medical history, current drug treatment, smoke habits, physical activity, alcohol intake and usual diet; furthermore, specific questions aimed at exploring depression and anxiety traits, sleep habits and the amount of time spent using computer or smartphones. In particular, specific items from validated questionnaires were embedded in order to explore the prevalence of: sleep-disordered breathing [25]; depression, anxiety and stress [26]; dietary sodium intake [27]. The English version of the questionnaire is available as on line supplement. Lastly, BP was measured three times by a Hypertension specialist in all centres, after at least 5 minutes of rest in the sitting position, according to the current guidelines [28], using an oscillometric validated device. Written informed consent was obtained from all recruited patients.

### Statistical analysis

All questionnaires were anonymised and data, collected by each recruiting team, were sent to the coordinating centre based in Pisa for statistical analysis, performed by means of NCSS 8 software (NCSS; Kaysville, Utah; USA). Continuous, normally distributed, variables are presented as mean and standard deviation; continuous, not normally distributed, variables are presented as median and

25-75 percentile; categorical variables are presented by counts and percentages.

Systemic arterial hypertension was defined by the mean of three BP measurements ≥140 mmHg for the systolic and / or ≥ 90 mmHg for the diastolic BP or when the volunteer was habitually treated with BP lowering drugs [28]. Patients with systolic, diastolic or systo-diastolic hypertension were identified. The whole sample was then divided into two subgroups of normotensive and hypertensive patients. The two subgroups were compared using unpaired t-test for continuous, normally distributed variables, Wilcoxon Rank Sum Test for continuous, not normally distributed variables and Chi-square test for discrete variables. When feasible, items from the questionnaires (See supplemental material) were transformed in dichotomous variables. The following dummy variables were created:

- question #8: eat out ≥1 times/day; eat restaurant/canteen ≥1 times/week; eat fast food ≥1 times/week; eat bar/street food ≥1 times/week; (1=yes for all; 0=no)
- question #9: add salt (often / always =1; never / sometimes= 0)
- question #10: salt bread (4 or more rolls/slices=1; 3 or less = 0)
- question #11: cheese/cold cuts (3 or more times/week=1; 2 or less=0)
- question #12: feel thirsty (always-often=1; never/rarely=0)
- question #13: food insipid out (insipid=1; normal/salty=0)

In order to detect possible determinants of hypertension in the study sample, a multiple logistic regression model was built, considering hypertension as the dependent variable. The independent variable were chosen among those associated with $p<0.05$ with hypertension in the univariate analysis. A gender-stratified analysis was also performed. A p value less that 0.05 was considered significant throughout the study.

## Results

During the 2014 "World Hypertension Day", data were collected from 6356 individuals (age range 18-105 years) in 50 hypertension centers[29]. 15 Hypertension centers in 13 cities (Ancona, Bologna, Brescia, Genova, Milano, Napoli, Palermo, Padova, Pisa, Roma, Torino, Terni, Udine) participated in this study: 508 individuals aged 18-35 years were selected and were given the self-administered questionnaire described above.. Based on inclusion / exclusion criteria, 4 individuals were excluded as were aged <18 years and 11 individuals for missing BP values. The final analysis was therefore performed on 493 individuals. Hypertension was present in 54 individuals, for a prevalence of 11%: 4 were already on BP-lowering treatment, 30 had systolic hypertension, 10 diastolic hypertension and 10 systo-diastolic hypertension. Only 15 out of 54 individuals were aware of their hypertension status (Table 1). Forty-one out of 54 hypertensive individuals were men; furthermore, hypertensive individuals showed a greater BMI and similar occupational and educational status than normotensives.

According to the self-reported medical history, the prevalence of established cardiovascular disease or its equivalents (diabetes mellitus, kidney disease) was very low (<1%), but significantly greater in the hypertensive subgroup (Table 1), while there were no differences as far as non-cardiovascular diseases were concerned (data not shown). Drug history revealed a significantly greater use of non-steroidal anti-inflammatory drugs and/or corticosteroids in the hypertensive subgroup (7.7% vs 1.6%, p=0.006). High birth weight was reported by 4.7%, while low birth weight and/or preterm birth by 10.3% of the study population, with no significant difference between the hypertensive and normotensive subgroups.

Among lifestyle measures, no significant differences in alcohol consumption, smoking habit, and habitual physical activity were observed (Table 1). Interestingly, despite a similar reported time spent using computer (>5 hours/day: 24.5% vs 20.2%, p=0.47), a subjective perception of an excessive use tended to be more frequent in the hypertensive subgroup (30.8% vs 20.3%, p=0.08).

As far as mood and sleep disorders are concerned, we found a significantly lower prevalence of anxiety in the hypertensive population. Hypertensive individuals more often reported snoring or witnessed sleep apneas, whereas subjective sleep duration was similar to normotensive individuals (Table 2). By analyzing questionnaire items exploring salt intake, hypertensive individuals were more likely to eat cheese and/or cold cuts 3 or more times/week (Figure 1). Furthermore, they were more likely to have their meals out 1 or more times/day; in particular, the prevalence of eating in fast-foods one or more times/week was almost two-fold in hypertensive in comparison to normotensive individuals (Figure 2).

Gender differences in clinical and lifestyle characteristics were analyzed. In our study sample,

women were younger, more frequently students and with a higher level of education compared to men (Table 3). They also had lower BMI and BP values, but reported a similar prevalence of CV risk factors and CV disease. Overall, women practiced less physical activity than men, while alcohol and cigarette habits were equally prevalent. Drug history revealed a significantly greater use of non-steroidal anti-inflammatory drugs and/or corticosteroids in men (4.3% vs 0.7%, p=0.01), while oral contraceptive were used by 9.6% of women. Despite a similar reported time spent at the computer (>5 hours/day: 21.6% vs 20.0%, p=0.66), a subjective perception of an excessive use was more frequent among men than women (26.3% vs 17.6%, p=0.02).
As far as mood and sleep disorders are concerned, women reported higher stress scores compared to men, whereas snoring and sleep apneas were more frequent in men (Table 4). In terms of salt intake, men were more likely to eat cheese and/or cold cuts 3 or more times/week and to eat more bread. Furthermore, they were more likely to have their meals out 1 or more times/day; the frequency of eating in fast-foods, restaurants, bars or having street food was higher in men for all the above mentioned categories (Table 4).

A multiple logistic regression model was built in order to identify risk factors independently associated to higher BP values in the overall population. Male sex, BMI and eating in fast foods one or more times per week were associated with an increased probability of having high BP values, while anxiety appeared as a protective factor (Table 5).

We performed the same analysis in men and women separately, in order to identify gender-specific predictors of high BP. Compared to the normotensive, in hypertensive men the following lifestyle habits were more prevalent: eating in fast foods one or more times/week (28.9 vs 11.3%, p=0.005), adding salt to prepared food (57.5 vs 40.2%, p=0.047), consuming cheese/cold cuts (75.6 vs 53.7%, p=0.01) and using NSAID/corticosteroids (10.0 vs 2.9%, p=0.046); furthermore, BMI was higher in the hypertensive group [25.8 (22.5-28.9) vs 23.7 (22.1-25.9) kg/mq, p=0.003]. In a model including the aforementioned variables, BMI [OR 1.13 (95%CI 1.03-1.24)] and eating in fast foods one or more times/week [OR 3.62 (95%CI 1.34-9.79)] were confirmed as independent predictors, together with the consumption of cheese and/or cold cuts 3 or more times/week [OR 3.04 (95%CI 1.23-7.51)]. Conversely, we could not find any variable associated to high BP values in women.

## Discussion

This cross-sectional survey was aimed at establishing the prevalence of high BP values in a sample of young adults recruited during the 2014 World Hypertension Day initiative in Italy and at exploring its relationship with lifestyle habits. The main result of this study is that the prevalence of high BP values among Italian individuals aged 18-35 years is a not negligible 11%, with a very low awareness and treatment percentage. The main predictors of the hypertensive status were gender, BMI and dietary habits such as eating in fast foods. Furthermore, we found remarkable gender differences, with women adhering to a globally healthier dietary lifestyle, with lower BMI and BP values. As a consequence, an association between incorrect dietary habits and high BP was found only in men.

This survey highlighted remarkable differences in hypertension prevalence, awareness and treatment between young adults and the overall population who had their BP measured in Italy during the WHD in the same years and recently reported by Tocci et al [30]. Indeed young adults, in spite of a lower hypertension prevalence (11% vs 55.4%), exhibited considerably lower rates of hypertension awareness (28.8% vs 67.4%) and treatment (7.7% vs 35.3%), in line with US data[3]. While hypertension prevalence has not substantially varied in Italy in the last decade, awareness and control has improved over time since 2004 WHD[30]. Though temporal trends in Italian young adults are not available, US data suggest a surge in prevalence [3, 4]. Thus, this survey suggests that an educational intervention aimed at improving knowledge and control of hypertension in young adults is strongly needed in Italy. In particular, screening campaigns in young adults and physician education to contrast medical inertia might be particularly useful [8].

The prevalence of systemic arterial hypertension among children and adolescents has increased in concert with the marked surge in obesity among the young [31], so that essential hypertension is the most prevalent form after the age of 6 years [32]. Accordingly, our study suggests that body weight and dietary habits are the main factors influencing BP in a cohort of young adults aged 18-35 years. Interestingly, the effect of dietary habits such as eating out often and eating cheese and cold cuts on BP is independent of BMI, suggesting that not only caloric intake, but also nutrient composition, especially sodium content, might play a role. Salt intake reduction is probably the single non-pharmacological intervention able to reduce BP, cardiovascular disease and mortality worldwide. The beneficial effects of salt intake reduction are constantly present regardless of age, gender and ethnicity [33]. Our results are in line with with a cross-sectional analysis collected in a cohort of 1248 adolescents aged 17 years old, showing that BMI and urinary sodium/potassium ratio were

significantly associated with BP values both in males and females [34]. Recently a retrospective survey demonstrated that among 300 young adults with incident hypertension, only 55% had documented lifestyle education within one year [35]. Conversely, our results clearly indicate that lifestyle education should be the most important intervention for BP reduction in young adults, and in particular in men. A poor quality-diet is constantly observed in young adults, as demonstrated by large cohort studies [17]. Aging is usually accompanied by positive changes in diet quality [17]: however, an unhealthy lifestyle in young age might not be innocent, since maintaining a healthy lifestyle throughout young adulthood is strongly associated with a low cardiovascular disease risk profile in middle age [36].

We did not find a correlation between alcohol consumption and BP values, unlike previous studies [34, 37]. The discrepancy with studies conducted in other countries might be due to the fact that, though alcohol is known to increase BP in a dose-dependent manner, wine consumption (traditionally more frequent in Italy) and other alcoholic beverages might have opposite effects on BP, due to their different polyphenol content [38]. Interestingly, in a study conducted in Italy, alcohol-related increase in BP was evident at the 24-hours blood pressure monitoring, but not at office BP [37].

The impact of emerging risk factors on BP appears to be negligible in the study population, although trends for a perceived excessive computer use and for reported snoring or sleep apnoeas were found in the hypertensive subgroup. As a matter of fact, larger population studies are required to reveal subtle effects. The inverse association found between anxiety score and BP values might be attributed to a population bias: anxious, otherwise healthy, people are more likely to volunteer for screening campaigns like the present one. Accordingly, in a retrospective analysis including 4362 patients from primary care, patients with anxiety and/or depression have a greater healthcare utilization, leading to a faster hypertension control [39].

It is worthwhile to comment upon gender differences in clinical and lifestyle profile in the present cohort. Women had globally healthier dietary habits, conceivably responsible for the lower BP and BMI values found in comparison with men. Hypertension in women was not associated to lifestyle characteristics, in contrast to men. A recent survey demonstrated that young women following a healthy lifestyle were virtually free of cardiovascular disease later on [40]. Taken together, these results suggest that gender differences in cardiovascular disease are attributable not only to biological/hormonal differences, but also to cultural and social factors influencing adherence to a healthy lifestyle. Effective strategies aimed at implementing lifestyle education especially in young men are warranted and might play a relevant role in hypertension prevention in the youth.

We must acknowledge some limitations. First, BP was measured on a single occasion, while to ascertain and confirm the diagnosis of arterial hypertension several measurements performed at least in two different occasions are necessary, often together with home blood pressure monitoring and, in selected cases, 24-hour ABPM [28]. Second, because of the nature of the World Hypertension Day, weight and height data were not measured directly, but referred, with the subsequent risk of weight underestimation and height overestimation; different settings (city squares, public hospitals and so on) might also have influenced BP values. Third, a selection bias, related to self-selection of participants who decided to have their BP measured in open checkpoints during the World Hypertension Day, cannot be excluded: thus, participants in this survey may not be representative of the general population. Finally, lack of blood and urine sample collection did not allowed a more accurate assessment of CV risk profile, sodium intake and secondary forms of hypertension.

## Conclusions

In conclusion, this cross-sectional survey performed during the 2014 World Hypertension Day initiative, suggested a relevant prevalence of high BP values among Italian young adults, with a very low rate of awareness and treatment. The gap between actual and desired BP control in Italy appears to be wider in young adults than in the older population. Since adiposity and dietary habits are the main predictors of the hypertensive status, especially in men, public health campaigns for hypertension prevention should focus on this target to be effective, in order to reach the ambitious 70% goal for BP control, which was the target of SIIA actions for 2015[7], also in young adults.

## Figure legends

Figure 1. Prevalence of salt intake - related habits to the overall study population

Figure 2. Prevalence of lifestyle habits related to eating out in the overall study population

## Table 1. Clinical characteristics of the study population according to the hypertensive status

| | Overall population (n=493) | Normotensive individuals (n=439) | Hypertensive individuals (n=54) | P value |
|---|---|---|---|---|
| Men (%) | 43.8 | 39.9 | 75.9 | <0.0001 |
| Age (years) | 25.7±4.4 | 25.6±4.4 | 26.5±4.6 | 0.14 |
| BMI (kg/mq) | 22.5 (20.3-25.0) | 22.2 (20.2-24.5) | 25.5 (22.4-28.6) | <0.0001 |
| Highest level of education attained: | | | | 0.65 |
| Degree or more | 40.4 | 40.3 | 41.5 | |
| High school diploma | 54.5 | 54.9 | 50.9 | |
| Less than high school | 5.1 | 4.8 | 7.5 | |
| Occupational status: | | | | 0.41 |
| Unemployed | 12.2 | 12.6 | 9.3 | |
| Employed | 34.8 | 33.8 | 42.6 | |
| Student | 53.0 | 53.7 | 48.1 | |
| Hypertension awareness (%) | 5.2 | 2.3 | 28.8 | <0.0001 |
| Use of BP-lowering drugs (%) | 0.8 | 0.0 | 7.7 | <0.0001 |
| Systolic BP (mmHg) | 119.3 | 116.3 | 144.3 | <0.0001 |
| Diastolic BP (mmHg) | 72.6 | 75.1 | 83.0 | <0.0001 |
| FC (bpm) | 75.9±11.5 | 75.0±11.0 | 83.8±12.2 | <0.0001 |
| Diabetes | 0.8 | 0.5 | 3.8 | 0.01 |
| Previous CV events | 0.6 | 0.2 | 3.8 | 0.002 |
| Chronic kidney disease | 0.6 | 0.5 | 1.9 | 0.21 |
| Hypercholesterolemia | 5.4 | 4.9 | 9.3 | 0.18 |
| Habitual physical activity (%): | | | | |
| No | 51.0 | 49.9 | 60.4 | 0.23 |
| 1-2 times/week | 14.0 | 14.8 | 7.5 | |
| >2 times/week | 35.0 | 35.3 | 32.1 | |
| Alcohol:>2 drinks/die (%) | 27.2 | 27.5 | 24.5 | 0.65 |
| Cigarette smoke (%) | | | | |
| No | 62.0 | 63.4 | 50.9 | 0.07 |
| Ex | 14.5 | 13.3 | 24.5 | |
| Yes | 23.5 | 23.3 | 24.5 | |

## Table 2. Sleep and mood characteristics according to the hypertensive status

| | Overall population (n=493) | Normotensive individuals (n=439) | Hypertensive individuals (n=54) | P value |
|---|---|---|---|---|
| Depression score | 3 (1-5) | 3 (1-5) | 3 (0-4) | 0.11 |
| Anxiety score | 3 (1-6) | 3 (1-6) | 2 (0-4) | 0.02 |
| Stress score | 5 (3-8) | 6 (3-9) | 5 (3-6) | 0.07 |
| Short sleep duration (%) | 35.2 | 34.2 | 43.4 | 0.18 |
| Snoring /sleep apneas (%) | 13.5 | 12.2 | 24.5 | 0.01 |
| Sleep dissatisfaction (%) | 26.5 | 27.2 | 20.4 | 0.28 |

## Table 3. Clinical characteristics of the study population according to gender

| | Overall population (n=493) | Women (n=277) | Men (n=216) | P value |
|---|---|---|---|---|
| Age (years) | 25.7±4.4 | 24.9±4.2 | 26.7±4.5 | <0.0001 |
| BMI (kg/mq) | 22.5 (20.3-25.0) | 20.9 (19.6-23.0) | 24.1 (22.3-26.2) | <0.0001 |
| Highest level of education attained: | | | | 0.02 |
| Degree or more | 40.4 | 43.5 | 36.4 | |
| High school diploma | 54.5 | 53.6 | 55.6 | |
| Less than high school | 5.1 | 2.9 | 7.9 | |
| Occupational status: | | | | 0.02 |
| Unemployed | 12.2 | 12.0 | 12.5 | |
| Employed | 34.8 | 29.7 | 41.2 | |
| Student | 53.0 | 58.3 | 46.3 | |
| Hypertension awareness (%) | 5.2 | 3.7 | 7.1 | 0.09 |
| Use of BP-lowering drugs (%) | 0.8 | 0.0 | 7.7 | <0.0001 |
| Systolic BP (mmHg) | 119.3 | 113.2±11.8 | 127.2±14.5 | <0.0001 |
| Diastolic BP (mmHg) | 72.6 | 70.4±8.0 | 75.5±8.9 | <0.0001 |
| FC (bpm) | 75.9±11.5 | 76.6±10.5 | 74.9±12.7 | 0.11 |
| Diabetes | 0.8 | 1.1 | 0.5 | 0.44 |
| Previous CV events | 0.6 | 0.4 | 0.9 | 0.42 |
| Chronic kidney disease | 0.6 | 1.1 | 0.0 | 0.13 |
| Hypercholesterolemia | 5.4 | 5.9 | 4.7 | 0.56 |
| Habitual physical activity (%): | | | | |
| No | 51.0 | 56.3 | 44.2 | 0.02 |
| 1-2 times/week | 14.0 | 13.7 | 14.4 | |
| >2 times/week | 35.0 | 30.0 | 41.4 | |
| Alcohol >2drinks/die (%) | 27.2 | 25.2 | 29.7 | 0.27 |
| Cigarette smoke (%) | | | | |
| No | 62.0 | 63.4 | 50.9 | 0.07 |
| Ex | 14.5 | 13.3 | 24.5 | |
| Yes | 23.5 | 23.3 | 24.5 | |

**Table 4. Sleep and mood characteristics and dietary habits according to gender**

| | Overall population (n=493) | Women (n=277) | Men (n=216) | P value |
|---|---|---|---|---|
| Depression score | 3 (1-5) | 3 (1-6) | 2 (1-5) | 0.07 |
| Anxiety score | 3 (1-6) | 3 (1-6) | 3 (1-5) | 0.03 |
| Stress score | 5 (3-8) | 6 (3-10) | 4 (2-7) | 0.0004 |
| Short sleep duration (%) | 35.2 | 33.1 | 37.9 | 0.27 |
| Snoring /sleep apneas (%) | 13.5 | 7.6 | 21.0 | <0.0001 |
| Sleep dissatisfaction (%) | 26.5 | 28.3 | 24.2 | 0.31 |
| Eat out>1/day | 41.6 | 31.0 | 55.4 | <0.0001 |
| Restaurant/canteen | 43.6 | 39.0 | 49.8 | 0.02 |
| Fast food | 10.3 | 6.9 | 14.6 | 0.006 |
| Bar street food | 40.7 | 35.2 | 47.4 | 0.008 |
| Add salt | 40.2 | 37.7 | 43.5 | 0.20 |
| Bread | 22.4 | 15.4 | 31.2 | <0.0001 |
| Cheese / cold cuts | 52.3 | 48.0 | 57.9 | 0.03 |
| Thirsty | 43.5 | 44.6 | 42.2 | 0.60 |

## Table 5. Multiple logistic regression, considering hypertension as dependent variable, in the overall population.

| | OR (95% CL) | Beta coefficient | $R^2$ | P value |
|---|---|---|---|---|
| Anxiety | 0.85 (0.75-0.97) | -0.16 | 0.025 | 0.018 |
| BMI | 1.14 (1.04-1.25) | 0.13 | 0.034 | 0.003 |
| Cheese/cold cuts 3+times/week | 1.99 (0.95-4.17) | 0.69 | 0.013 | 0.069 |
| Fast food 1+times/week | 3.10 (1.21-7.95) | 0.99 | 0.015 | 0.041 |
| Eat out 1+/day | 1.11 (0.51-2.44) | 0.11 | 0.000 | 0.791 |
| Snoring/apneas | 1.35 (0.53-3.42) | 0.30 | 0.001 | 0.529 |
| Male sex | 3.19 (1.33-7.63) | 1.15 | 0.028 | 0.009 |
| NSAIDs/corticosteroids | 1.98 (0.46-8.49) | 0.68 | 0.003 | 0.355 |

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