

# Cross-sectional study of major modifiable cardiovascular disease risk factors among adults in Morocco

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## Abstract

**Background:** Mortality due to cardiovascular disease in Morocco is estimated at 38%, making it a significant burden on public health.

**Aim:** To provide updated estimates of the prevalence of major modifiable cardiovascular disease risk factors among adults in Morocco.

**Methods:** This descriptive, cross-sectional study collected and analysed sociodemographic, lifestyle, medical and anthropometric data from 731 adults aged ≥18 years in Casablanca, Morocco, in 2018.

**Results:** Of the participants, 81.1% reported physical inactivity, with higher prevalence among women than men ( $P = 0.031$ ). Prevalence of smoking was 18.2% and of alcohol consumption 6.8%, with stronger male predominance ( $P < 0.0001$ ), while prevalence of obesity was 20.7% and of overweight 30.8%. Central obesity affected 8.7% of men and 61.1% of women. Diabetes prevalence was 6.6% (10.3% among women, 3.2% among men;  $P < 0.001$ ), while arterial hypertension affected 9.6% (14.8% of women, 4.8% of men;  $P < 0.001$ ) of the participants.

**Conclusion:** The significant high levels of modifiable cardiovascular disease risk factors found by this study among adults in Casablanca, Morocco, highlight the need for more effective and more sustainable cardiovascular disease prevention strategies and policies among the population.

Keywords: cardiovascular disease, hypertension, diabetes, smoking, obesity, overweight, lifestyle, Morocco

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## Introduction

Cardiovascular disease (CVD) is the leading cause of death globally, accounting for 17.9 million deaths annually, or 44% of all deaths due to noncommunicable diseases (NCDs) and 31% of total global mortality (1,2). These are the leading causes of death in all parts of the world except in sub-Saharan Africa, where infectious diseases still dominate, and South Korea and Japan, where cancer causes the highest number of deaths (1,2).

CVDs are a set of disorders affecting the heart and blood vessels, including coronary artery disease, stroke, congenital heart malformations and heart failure. These conditions often originate from atherosclerosis, a progressive process that silently develops over years before manifesting as severe complications such as heart attack and stroke (3).

In Morocco, recent epidemiology of CVD remains relatively understudied. National data primarily focus on hypertension, and the absence of a comprehensive national registry has resulted in most estimates being derived from global datasets or studies limited to specific populations, such as women or patients already diagnosed with CVD (4,5). A systematic review by Es-Sabir et al on CVD and risk factors in Moroccan women reported high rates of obesity (up to 44.9%),

hypertension (29.8–39.3%), diabetes (7.2–12.6%), and gestational diabetes (15.2%), highlighting the urgent need for targeted public health interventions (6). Another national study documented the increasing burden of CVD in Morocco over 16 years, driven by hypertension, diabetes and lifestyle-related risk factors, with a significant impact on women, older adults and urban populations (5).

The development of CVD is influenced by a variety of risk factors, specifically those that increase the risk of developing a chronic CVD. WHO classifies cardiovascular risk factors based on their nature as: modifiable, non-modifiable, causal or associative. This classification identifies 2 main categories of risk factors (3,7): non-modifiable factors such as age, sex and family history, and modifiable factors such as unhealthy diet, physical inactivity, smoking, etc. While non-modifiable factors cannot be altered, their interplay with modifiable factors is critical. Age amplifies the effects of modifiable factors such as hypertension and dyslipidaemia by causing arterial stiffness and reduced endothelial function, increasing vulnerability due to smoking, inactivity and unhealthy diet. Managing these factors in older adults is critical to reduce cardiovascular risk and prevent atherosclerosis, which can lead to heart attacks and strokes (1,8).

Cardiovascular risk factors can be systematically assessed using established risk prediction tools such as the Framingham Risk Score (9), SCORE (Systematic Coronary Risk Evaluation) (10), and the WHO/International Society of Hypertension (WHO/ISH) risk prediction charts (11). These tools have been widely validated and are effective in estimating an individual's likelihood of developing cardiovascular disease over a specified period, enabling targeted preventive strategies. For instance, Faramarzi et al demonstrated the effectiveness of the WHO/ISH risk charts in estimating cardiovascular risk and identifying high-risk individuals, highlighting the importance of integrating these models into routine assessments, particularly among high-risk populations (11).

Preventing and managing CVD requires identification and addressing of modifiable risk factors. In clinical practice, prevention guidelines emphasize several key measures. Lifestyle management is pivotal in preventing CVD, focusing on modifiable risk factors like physical inactivity, smoking and obesity. The 2021 European Society of Cardiology guidelines advocate personalized strategies, including healthy diets, regular exercise, smoking cessation, and weight management, complemented by pharmacological treatments such as statins and antihypertensives. Risk assessment tools help in tailoring prevention efforts. However, challenges such as non-adherence, inaccessibility and lack of clinical integration require patient-centred, multidisciplinary approaches to improve outcomes across populations (12,13). Thus, understanding the prevalence of these risk factors is essential for developing effective prevention and management strategies.

This study examined the prevalence of each risk factor among adult populations in Casablanca, Morocco. We evaluated the prevalence of modifiable cardiovascular risk factors such as obesity, smoking, inactivity and alcohol use and analysed non-modifiable factors like age and sex. We hypothesized significant sex-related differences in modifiable risk factors, influenced by critical non-modifiable factors.

## Methods

### Study participants

We carried out a descriptive, cross-sectional study among 731 adult participants aged  $\geq 18$  years, of both sexes, from various prefectures in Casablanca, Morocco. Participants resided in the study region during data collection, March–June 2018, and were selected through cluster sampling to ensure representativeness of the adult population. Exclusion criteria were being pregnant, having mental illness, nursing a sick person, and participation in the pretest. The objectives and methodology of the study were explained to participants, and they all provided informed consent prior to participation.

### Study design

We used a 3-tiered stratified method. First, 80 clusters were randomly selected from some geographical areas (neighbourhoods) of Casablanca to ensure diversity. Second, 10 households were randomly selected within each cluster. And one adult from each household was randomly selected to participate. This systematic design helped minimise bias and ensured representation across demographic and geographical strata.

### Data collection

Information on sociodemographic characteristics and lifestyle factors was collected using a questionnaire. The questionnaire (available at: [https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/steps/part5-section2.pdf?sfvrsn=be2f8117\\_2](https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/steps/part5-section2.pdf?sfvrsn=be2f8117_2)) was adapted from the WHO tools for chronic disease monitoring, widely recognized for their reliability and validity (14) and was administered by trained individuals. To ensure cultural suitability and applicability to the Moroccan context, the questionnaire was revised and adapted. This included translation into Arabic and review by a panel of local public health and epidemiology experts. A pretest was conducted among 50 participants from different backgrounds to assess the clarity, cultural relevance and feasibility of the questions. Their feedback was used to refine the questionnaire.

### Sociodemographic parameters

The questionnaire contained questions on several aspects of the participants' lives.

### Lifestyle factors

The lifestyle questions focused mainly on tobacco use, alcohol consumption, physical activity to determine their smoking habits: "Do you currently smoke or have you smoked in the past?", "If yes, how many years have you been smoking (or did you smoke)?", "If you have quit smoking, how long ago did you stop?", "How many cigarettes (or other forms of tobacco) do/did you smoke per day?" Participants were classified into 3 groups: current smokers, ex-smokers and non-smokers.

Questions on alcohol consumption were used to categorise participants as consumers or non-consumers. Physical activity was assessed through a detailed frequency questionnaire covering weekdays, weekends, occupational activity, commuting methods, leisure and sports. Using the WHO guidelines, participants were classified as active ( $\geq 30$  minutes of moderate or intense physical activity daily), or sedentary (15).

### Medical history

This section of the questionnaire was designed to gather information about participants' chronic health conditions, specifically focusing on diabetes and hypertension. Participants were asked direct questions to determine their health status, including: "Do you have any chronic disease?" "If yes, which condition do you have: hypertension, diabetes or other conditions?" "How long

have you had this condition?” “Are you currently taking any medications for it?” These questions provided a clear understanding of the prevalence and duration of chronic diseases among the studied population and whether participants were undergoing treatment.

### **Anthropometric measurements**

Weight was measured in kilograms using a scale, with participants wearing minimal clothing and no shoes. Height was recorded in centimetres using a height gauge, with participants standing barefoot. Body mass index (BMI) was calculated as weight (kg) divided by height squared ( $m^2$ ), following WHO guidelines. Participants were categorized into underweight (BMI < 18.5  $kg/m^2$ ), normal weight (BMI 18.5–24.9  $kg/m^2$ ), overweight (BMI 25.0–29.9  $kg/m^2$ ) and obese (BMI  $\geq$  30.0  $kg/m^2$ ) (16).

Waist circumference was measured at the midpoint between the last palpable rib and the iliac crest, and hip circumference at the widest point over the buttocks. Central obesity was assessed using the waist-to-hip ratio (WHR), with obesity defined as WHR > 0.90 for men and > 0.85 for women (16).

### **Statistical analysis**

All statistical analyses were conducted using SPSS version 23. Descriptive analyses were performed to calculate median and mean with standard deviation (SD) for quantitative variables, and frequency (%) for qualitative variables. Categorical variables were assessed using the chi-square test, and differences between groups were evaluated using the Student t-test.  $P < 0.05$  was considered statistically significant.

### **Ethics approval**

The study adhered to the Helsinki Declaration, was approved by Casablanca's biomedical research ethics committee, and informed consent was obtained from participants.

## **Results**

A total of 731 of the 800 participants initially selected took part in the survey (response rate 91.4%): 48.2% were women, and 45.0% belonged to the 20–29 and 30–39 years age groups (Table 1). Thus, 78.2% of the participants had some education (primary, secondary, or university), with more than 20% illiterate or having only informal education (in this context informal education refers to literacy programmes aimed at individuals who have not received formal schooling: these programmes are designed to teach basic reading, writing, and numeracy skills outside traditional educational institutions). A majority of the respondents were married (51.6%), more than 70% of the males were classified as having an occupation compared with only 39.0% of the females (42.0% of the females were housewives).

Current smoking prevalence was 18.2%, higher among men (31.9%) than women (3.5%) (Table 2). Ex-smokers accounted for 9.2%, with a higher prevalence among

men (14.5%) than women (3.5%). Alcohol consumption was reported by 6.8%, predominantly among men (11.6%) (women 1.7%). Of the participants, 18.9% considered themselves to be physically active (men 21.6%, women 16%), while 81.1% led sedentary lifestyles, more common among women (84%) than men (78.4%).

Overweight affected 30.8% [men 30.6%, women 30.8%; ( $P < 0.001$ )], and obesity 20.7% (men 7.9%, women 34.4%), with women showing higher average BMI and obesity rates. Mean waist size was 86.54 cm, higher among women (89.34 cm) than men (84.00 cm). Central obesity was significantly more prevalent among women ( $P < 0.001$ ) (Table 3).

The overall prevalence of diabetes among our participants was 6.6%, much higher among women (10.3%) than men (3.2%) (Table 4). Similarly, the prevalence of hypertension was significantly higher among women (14.8%) than men (4.8%). The association between diabetes and arterial hypertension showed a 3.0% prevalence in the study sample. Prevalence of both pathologies was statistically significantly higher among women (4.8%) than men (1.3%) ( $P < 0.05$ ).

Only 20.5% of the participants had no cardiovascular risk factors (diabetes, hypertension, obesity, sedentary lifestyle, tobacco use, and excessive alcohol consumption): 42.9% had one risk factor, 25.1% had 2, 10.2% had 3, and 1.4% had 4.

## **Discussion**

Our findings on cardiovascular risk factors among adults in Casablanca, Morocco, suggest that there is a high prevalence of the studied risk factors among the population.

Obesity poses a significant health risk to individuals in several countries, leading to a considerable burden on the healthcare system (1,2). Prevalence of overweight was 30.8%, and obesity 20.7% in our study; these findings are similar to those of the 2018 national survey, where the prevalence of obesity was 20% and overweight 33% (17). We found a higher prevalence of obesity among women, with 34.4% being classified as obese. The disparity in prevalence of obesity between males and females was highly statistically significant in our study population, similar to the findings from our previous research in Morocco (18), and the most recent national survey (2017–2018) (17). According to that survey, the proportion of individuals with BMI  $\geq$  25 was 53.0%, with a significantly higher prevalence among women than men (63.4% vs 42.6%). Comparing with previous studies, prevalence of obesity among women in Morocco has increased from 29% (2018), 21.7% (2000), and 20.9% (2011) in previous studies (17,19,20). Various hypotheses have been put forward to account for this increase. These include factors such as excessive dietary intake and poor levels of physical activity: housewives particularly have limited opportunities for physical activity because of their domestic responsibilities and restricted access to recreational facilities. These lifestyle constraints,

**Table 1. Sociodemographic characteristics of study participants (N = 731)**

Characteristic	Total (N = 731) %	Women (n = 352) %	Men (n = 379) %
<b>Sex</b>		48.2	51.8
<b>Age (years)</b>			
< 20	8.3	5.7	10.8
20–29	25.6	23.0	28.0
30–39	19.4	17.0	21.6
40–49	18.9	24.7	13.5
50–59	16.3	17.3	15.3
≥ 60	11.5	12.2	10.8
<b>Marital status</b>			
Single	38.6	25.9	50.4
Married	51.6	58.0	45.6
Divorced	3.0	4.8	1.3
Widowed	4.8	9.4	0.5
No response	2.1	2.0	2.1
<b>Education level</b>			
Illiterate	19.2	27.4	11.5
Informal education	2.6	2.4	2.8
Primary school	18.8	19.7	17.9
Secondary	41.5	30.9	51.7
University	17.9	19.7	16.2
<b>Occupational activity</b>			
Active	55.3	39.0	70.4
Student	12.1	12.2	12.1
Housewife	20.1	42.0	–
Retired	3.9	2.4	5.2
Unemployed	8.6	4.5	12.3
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>
<b>Age (years)</b>	39.10 (15.33)	40.89 (14.65)	37.41 (16.00)

SD = standard deviation

**Table 2. Lifestyle characteristics of study participants (N = 731)**

Factor	Total (N = 731) %	95% CI	Women (n = 352) %	95% CI	Men (n = 379) %	95% CI	P value
<b>Tobacco</b>							< 0.0001
Current smoker	18.2	15.40–20.99	3.5	1.58–5.41	31.9	27.20–36.59	
Ex-smoker	9.2	7.10–11.29	3.5	1.58–5.41	14.5	10.95–18.04	
Non-smoker	72.6	69.36–75.83	93.1	90.45–95.74	53.6	48.57–58.62	
<b>Alcohol consumption</b>							< 0.0001
Consumer	6.8	4.97–8.62	1.7	0.34–3.05	11.6	8.37–14.82	
Non-consumer	93.1	91.26–94.93	98.3	96.94–99.65	88.4	85.17–91.62	
<b>Physical activity</b>							0.031
Active	18.9	16.06–21.73	16.0	12.17–19.82	21.6	17.45–25.74	
Sedentary	81.1	78.26–83.93	84.0	80.17–87.82	78.4	74.25–82.54	

P significant at &lt; 0.05

**Table 3. Anthropometric characteristics of study participants (N = 731)**

Parameter	Total (N = 731) %	95% CI	Women (n = 352) %	95% CI	Men (n = 379) %	95% CI	P value
<b>BMI class</b>							< 0.001
Underweight	5.7	4.01–7.38	4.5	2.33–6.66	6.9	4.34–9.45	
Normal	42.8	39.21–46.38	30.1	25.30–34.89	54.6	49.58–59.61	
Overweight	30.8	27.45–34.14	31.0	26.16–35.83	30.6	25.96–35.23	
Obese	20.7	17.76–23.63	34.4	29.43–39.36	7.9	5.18–10.61	
<b>Central obesity<sup>a</sup></b>	–	–	61.1	–	8.7	–	< 0.001
	<b>Mean (SD)</b>	<b>95% CI</b>	<b>Mean (SD)</b>	<b>95% CI</b>	<b>Mean (SD)</b>	<b>95% CI</b>	
<b>Waist size (cm)</b>	86.54 (15.02)	85.45–87.62	89.34 (16.95)	87.56–91.11	84.00 (12.51)	82.74–85.25	0.001

<sup>a</sup>Central obesity was assessed using the waist-to-hip ratio

CI = confidence interval; BMI = body mass index; SD = standard deviation; P significant at < 0.05

**Table 4. Medical history of study participants (N = 731)**

Condition	Total (N = 731) %	95% CI	Women (n = 352) %	95% CI	Men (n = 379) %	95% CI	P value
Diabetes	6.6	4.8–8.39	10.3	7.12–13.47	3.2	1.42–4.97	< 0.001
Hypertension	9.6	7.46–11.73	14.8	11.09–18.5	4.8	2.64–6.95	< 0.001
Both	3.0	1.76–4.23	4.8	2.56–7.03	1.3	0.15–2.44	0.006

CI = confidence interval; P significant at < 0.05.

combined with dietary habits that may favour energy-dense foods, contribute to the observed sex-related disparity (21). Cultural factors play a significant role in this context: there is often societal preference for curvier body shapes for women, which may reduce any perceived need for weight control (22). The psychological, hormonal and physiological changes that occur after menopause can also lead to weight gain (23). The transition from estrogen dominance to a more androgenic state leads to alterations in body composition, characterized by increased fat accumulation and loss of lean body mass (24).

The prevalence of current smoking in our study was 18.2%, higher than in the last national survey (11.7%) (17). There was a distinct predominance of smoking among males (31.9% compared with 3.5% among females;  $P < 0.0001$ ). Our finding is confirmed in other research: male dominance was shown in a study by Imzil et al, where the overall prevalence of smoking among the participants was 14.6% and all smokers were male (25), and in the national survey of risk factors for chronic disease, where 23.4% of males and 0.3% of females were current smokers (14). The findings are similar to the results of a study conducted among the Azar cohort population, where 29.5% of current smokers were men and 0.5% were women (11).

Alcohol consumption was 6.8%, with a clear male predominance (11.6% vs 1.7%,  $P < 0.0001$ ). According to the latest figures from the national survey of 2017–2018 in Morocco, the prevalence of current alcohol consumption during the last 30 days was 1.7% [95% confidence interval (CI): 1.2–2.3], with those aged 30–44 years recording the highest proportion [2.7% (95% CI: 1.7–3.8)] (17).

Comparison between the sexes was not reported due to the low number of women drinkers. These data remain well below the global prevalence (17).

Our results showed that prevalence of physical inactivity was high, at 81.1%, greater among women (84.0%) than men (78.4%), similar to findings from other studies (17,26). The prevalence of physical inactivity varied significantly depending on the region and income level of countries in 2016, with the highest levels in Latin America and the Caribbean, in high-income Western countries, and in the Asia-Pacific region, with a general female predominance (26). Latest figures from the national survey in Morocco shows that 21.1% (19.9–22.3) of the population aged 18+ years were physically inactive. Women were more likely to document sedentary behaviour (26.0%; 95% CI: 24.4–27.5) than men (16.1%; 95% CI: 14.3–17.8) (17).

Among our participants, prevalence of diabetes was 6.6%, with a notable predominance among women. This was lower than findings from the 2018 national survey, where the proportion was 10.6% among adult population (17). Our findings agree with the outcomes of other research, which found that women had a high prevalence of diabetes and which highlight significant disparities between the sexes in the incidence of CVD (27). Women consistently exhibited more CVD risk factors than men, particularly diabetes and hypertension. A 2019 meta-analysis of 5 162 654 participants reported that women with diabetes faced a substantially elevated risk of mortality from coronary heart disease, with a 58% higher risk than their male counterparts. This highlights the pronounced impact of diabetes on cardiovascular health among women (28). These findings further substantiate

the elevated cardiovascular risk associated with diabetes among women.

Our findings align with those of a recent meta-analysis on hypertension among Asian populations which reported a greater prevalence among women (29). That study indicated that the association between hypertension and risk of CVD was more pronounced among females than males. Specifically, the impact of elevated systolic blood pressure on the risk of CVD was notably greater among women than men.

Our study had some limitations. The main one was the cross-sectional design, which precludes establishing causality between risk factors and cardiovascular outcomes. Self-reporting of variables such as physical activity may have introduced recall or social desirability bias. Although the sampling method aimed for representativeness, remote or rural areas may have been underrepresented, limiting the generalizability of our findings. Cultural or contextual factors influencing behaviours may not have been fully captured. Focusing solely on adults excluded insights into cardiovascular risks among adolescents or older adults with specific health conditions. We believe that acknowledging these

limitations enhances the transparency and robustness of our findings.

## Conclusion

The significant high levels of modifiable cardiovascular disease risk factors among our study participants highlight the need for more effective and more sustainable CVD prevention strategies and policies among the population. While the sampling method was robust, certain subgroups, such as those in remote areas, may require further investigation to better understand their specific risk profiles. Future research should build on these findings to guide tailored public health strategies and address gaps in knowledge regarding underserved populations.

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**Competing interests:** None declared.

## Étude transversale des principaux facteurs de risque modifiables de maladies cardio-vasculaires chez les adultes au Maroc

### Résumé

**Contexte :** La mortalité associée aux maladies cardio-vasculaires au Maroc est estimée à 38 %, ce qui en fait un fardeau important pour la santé publique.

**Objectif :** Fournir des estimations mises à jour sur la prévalence des principaux facteurs de risque modifiables de maladies cardio-vasculaires chez les adultes au Maroc.

**Méthodes :** La présente étude descriptive et transversale a collecté et analysé des données sociodémographiques, médicales, anthropométriques et sur le mode de vie auprès de 731 adultes âgés de 18 ans ou plus à Casablanca, au Maroc, en 2018.

**Résultats :** Parmi les participants, 81,1 % ont rapporté une sédentarité, avec une prévalence plus élevée chez les femmes que chez les hommes ( $p = 0,031$ ). La prévalence du tabagisme était de 18,2 % et celle de la consommation d'alcool de 6,8 %, avec une forte prédominance masculine ( $p < 0,0001$ ), tandis que la prévalence de l'obésité était de 20,7 % et celle du surpoids de 30,8 %. L'obésité centrale touchait 8,7 % des hommes et 61,1 % des femmes. La prévalence du diabète était de 6,6 % (10,3 % chez les femmes, 3,2 % chez les hommes ;  $p < 0,001$ ), tandis que l'hypertension artérielle concernait 9,6 % des participants (14,8 % des femmes, 4,8 % des hommes ;  $p < 0,001$ ).

**Conclusion :** Les niveaux significatifs de facteurs de risque modifiables de maladies cardio-vasculaires relevés par la présente étude chez les adultes à Casablanca soulignent la nécessité de stratégies et de politiques de prévention plus efficaces et plus durables au sein de la population.

## دراسة مقطعية لأهم عوامل خطر أمراض القلب والأوعية الدموية القابلة للتعديل في صفوف البالغين في المغرب

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### الخلاصة

**الخلفية:** يُقدَّر معدل الوفيات الناجمة عن أمراض القلب والأوعية الدموية في المغرب بنسبة 38%، وهو ما يُشكل عبئاً كبيراً على الصحة العامة. **الأهداف:** هدفت هذه الدراسة إلى تقديم تقديرات محدثة عن معدل انتشار أهم عوامل خطر أمراض القلب والأوعية الدموية القابلة للتعديل بين البالغين في المغرب.

**طرق البحث:** جمعت هذه الدراسة الوصفية المقطعية وحللت بيانات اجتماعية وسكانية وطبية وأنثروبومترية وبيانات خاصة بنمط الحياة من 731 بالغاً، تبلغ أعمارهم 18 عاماً فأكثر في الدار البيضاء، المغرب، في عام 2018.

**النتائج:** أفاد 81.1% من المشاركين شعورهم بالخمول البدني، مع ارتفاع معدل الانتشار بين النساء مقارنة بالرجال (قيمة الاحتمال = 0.031). وبلغ معدل انتشار التدخين وتعاطي المسكرات 18.2% و6.8%، على التوالي، مع انتشارهما بنسب أكبر بين الذكور (قيمة الاحتمال > 0.0001)، في حين بلغ معدل انتشار السمنة وزيادة الوزن 20.7% و30.8%، على التوالي. ويعاني 8.7% من الرجال و61.1% من النساء من السمنة المركزية. وبلغ معدل انتشار السكري بين المشاركين 6.6% (10.3% بين النساء، و3.2% بين الرجال؛ قيمة الاحتمال > 0.001)، وكان 9.6% من المشاركين مصابين بارتفاع ضغط الدم الشرياني (14.8% من النساء، و4.8% من الرجال؛ القيمة الاحتمالية > 0.001).

**الاستنتاجات:** إن المستويات الكبيرة لعوامل خطر أمراض القلب والأوعية الدموية القابلة للتعديل التي توصلت إليها هذه الدراسة بين البالغين في المغرب تسلط الضوء على الحاجة إلى استراتيجيات وسياسات وقائية أكثر فعالية واستدامة بين السكان.

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