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ORIGINAL ARTICLE

Prevalence of Cardiovascular Risk Factors and Related Medical and Lifestyle Interventions Among Italian Cardiovascular Specialists: A Proof-of-Concept Study

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Abstract

Introduction Physicians and researchers in the cardiovascular field are constantly engaged in the promotion of guidelines-directed preventive measures, but whether they are themselves adherent to the same recommendations was only sporadically examined.

Aim To assess awareness of self-exposure to cardiovascular risk factors and related management among cardiovascular specialists.

Methods During the National Conference of the Italian Society of Hypertension (October 2022), a pilot observational study on consecutive volunteer cardiovascular specialists was conducted. Participants underwent standard sitting and standing blood pressure (BP) measurements and answered a questionnaire regarding modifiable/non modifiable cardiovascular risk factors and related treatments. Based on self-declarations and actual measurements, BP was classified as optimal, normal, high-normal BP, and new hypertension in untreated participants, and as treated/untreated pre-existing hypertension. Controlled hypertension was defined as BP < 140/90 mmHg; age-adjusted lower targets were also applied, according to guidelines.

Results In total, 62 participants (30 F, mean age 43.2 ± 14.8 years) were enrolled; 79% reported regular physical activity; 53% of women and 38% of men were on a low-salt diet. After smoke (19.4%), dyslipidemia was the second most common risk factor (17.7%), often occurring with high BP (26.3%) and left untreated (36.7%). Pre-existing hypertension (11.3%) was often uncontrolled (57.1%) and associated with non-adherence to guidelines-directed lifestyle recommendations. About one in 12 participants was unaware of having high measured BP values.

Conclusions Despite the specific professional exposure, a margin for improvement in self cardiovascular risk factors awareness and management remains in this exploratory sample of cardiovascular specialists. This pilot research anticipates forthcoming, larger studies during national and international conferences.

Keywords Hypertension · Healthy lifestyle · Cardiometabolic risk factors · Cross-sectional studies · Guidelines adherence

1 Introduction

Hypertension is a widespread and a leading cardiovascular risk factor in adulthood and older age and its incidence has increased over the past few decades [1]. It is often

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accompanied by other modifiable and unmodifiable metabolic risk factors, like dyslipidemia, smoking, high sodium intake, obesity, and physical inactivity, all of which concur in determining the burden of related diseases [2]. In recent years, a substantial effort of researchers, physicians, and experts in the field was focused on the evaluation of the true prevalence of hypertension and concomitant, additional risk factors for cardio- and cerebrovascular diseases in different populations [3–7]. Following the release of updated prevention guidelines [8–10], in fact, cardiovascular risk profiling has been confirmed as a mainstay of disease prevention, and indulging in blood pressure (BP) values formerly acceptable as therapeutic goals was deemed as intolerable. Hypertension guidelines provide guidance on prevention, screening, and management of hypertension [8–10]. The same guidelines recommend routine assessment of individuals' lifestyle habits, in the awareness that adherence to a healthy lifestyle concurs at the reduction of cardiovascular risk and related disease burden. Lifestyle modifications targeted at reducing BP values and controlling other cardiovascular risk factors are related to diet, body weight reduction, regular physical activity, and smoking cessation [9]. Thus, physicians in the cardiovascular field are recommended to promptly identify individuals with the above-mentioned risk factors and to provide them with tailored pharmacological and non-pharmacological treatment strategies.

Several epidemiological studies periodically conducted so far [1, 6], complemented by real world evidence mostly collected during worldwide screening campaigns [7, 11–13], have assessed the prevalence and management strategies of hypertension and related cardiovascular risk factors across categories of age, sex, income, and geographical areas, serving as the litmus test of the extent to which guidelines were in fact applied in different clinical and demographic settings. Indeed, to date very few are the studies that have evaluated the prevalence of modifiable/unmodifiable cardiometabolic risk factors and their guidelines-directed management among hypertension specialists and researchers.

Herein, we conducted a pilot observational study on cardiovascular specialists attending the 2022 National Conference of the Italian Society of Hypertension to assess their awareness of self-exposure to cardiovascular risk factors, and whether they were themselves adherent to guidelines recommendations.

2 Methods

2.1 Study Design and Population

During the National Conference of the Italian Society of Hypertension (October 6–8, 2022), a pilot observational study was conducted with the aim of assessing the awareness of self-exposure to cardiovascular risk factors and related management on consecutive volunteer cardiovascular specialists who attended the conference as speakers or attendees. Self-presenting individuals who were willing to participate underwent BP measurements and answered a questionnaire on cardiovascular risk factors and lifestyle habits. Individuals attending the conference as non-health professionals were excluded. Participation in the study was completely voluntary, and data were anonymized at enrollment, making identification of participants not possible. The research was conducted in compliance with the Helsinki declaration [14] and the European General Data Protection Regulation (EU GDPR), article 89 [15]. Given the use of aggregated, anonymous data, ethical approval was amended.

2.2 BP Measurement

Participants underwent three standard sitting and two standing (1–3 min) blood pressure (BP) measurements with standard protocols, according to guidelines [8], using a semiautomated BP monitor (Omron®M2) with properly sized bladder cuffs based on upper arm circumference. Sitting BP and heart rate (HR) were assessed by trained physicians after 2 min rest. Measurements occurred in a dedicated room nearby the conference halls. Mean sitting BP and HR were calculated as the average of the second and third measurements. Information on the timing of BP measurement (morning/afternoon) as well as on exposure to possible modifying conditions (fasting > 8 h; drank coffee < 3 h; smoked < 1 h) was also collected.

2.3 Covariates of Interest

Besides BP measurement, participants answered a questionnaire regarding modifiable/non modifiable cardiovascular risk factors and related treatments. Specifically, the following variables were collected: age; sex; race/ethnicity; professional qualification (resident, PhD student, researcher, university or hospital employee, freelancer physician, retired, unemployed); work commitments (night shifts; if yes, time since the last night shift: < 24 h, 24–72 h, > 72 h); conference commitments (speaker or attendee; whether BP was assessed before or after the speech); weight (kg); height (cm); in women: information on menopause, pregnancy, use of hormone replacement therapy, use of contraceptive pill; smoking habits; history of diabetes mellitus, hypertension, dyslipidemia, hyperuricemia, atrial fibrillation, established cardiovascular disease (CVD) (i.e., ischemic heart disease, previous stroke/transient ischemic attack [TIA], peripheral arterial disease), chronic kidney disease (CKD), defined as estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73 m^2; whether engaged in at least 150 min/week

of moderate intensity physical activity; whether on a low salt diet; vaccination status against SARS-CoV-2; and any previous SARS-CoV-2 infection. Information on ongoing therapy with any RAAS-inhibitor, calcium channel blocker (CCB), beta-blocker (BB), diuretic, antiplatelet agent, statin, PCSK9-inhibitor, poly-unsatured fatty acid (PUFA), GLP1-R agonist, SGLT2-inhibitor, insulin, hypouricemic agent, steroid, nonsteroidal anti-inflammatory drug (NSAID), or other antidyslipidemic, antihypertensive, or oral antidiabetic agent was also collected. Body mass index (BMI) was calculated based on self-declared weight and height; based on BMI, participants were classified as underweight (BMI < 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), and obese (BMI ≥ 30). Self-reported anthropometric data were expressed as numeric variables; other data were expressed as categorical variables. The 2005 US National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) criteria were applied for the definition of waist criteria for metabolic syndrome (≥ 88 cm if women, ≥ 102 cm if men) [16].

2.4 Statistical Analysis

BP was treated as both a numeric value (mmHg) and a categorical variable. Based on self-reported information and measured values, BP was classified as optimal (< 120/80 mmHg without treatment), normal (120–129/80–84 mmHg without treatment), high-normal (130–139/85–89 mmHg without treatment) [8], new hypertension (≥ 140 and/or 90 mmHg without treatment), and self-reported hypertension. Controlled hypertension was defined as BP < 140/90 mmHg in the first place, and then as BP < 130/80 mmHg in treated participants < 70 years with normal renal function, and < 140/80 mmHg if ≥ 70 years or with CKD, according to 2021 European Society of Cardiology (ESC) guidelines on cardiovascular prevention [9]. Orthostatic hypotension was defined as a decrease in systolic BP ≥ 20 mmHg or in diastolic BP ≥ 10 mmHg after 1 or 3 min on standing; orthostatic hypertension was defined as an increase in systolic BP ≥ 20 mmHg or in diastolic BP ≥ 11 mmHg after 1 or 3 min on standing.

Given its bimodal distribution, the variable "age" was expressed as both mean ± standard deviation (SD) and median with interquartile range (IQR).

Differences in participants' characteristics and BP profile overall and across subgroups of sex, BP category, age quartiles, and selected risk factors (sedentary habits, dyslipidemia) were evaluated with unpaired t tests for continuous variables (mean ± SD) and χ^2 test for categorical variables (N, %). Statistical analyses were performed using R (v 4.0.2) [17]. Significance was set at $p < 0.05$.

3 Results

3.1 Overall Sample Characteristics

In total, 62 volunteers (mean age 43.2 ± 14.8 years; median age 38, IQR 28; 12.9% aged 65 years and above; 48.4% women) participated in the survey. Their demographic and clinical features are reported in Table 1.

Most participants (75.8%) had normal BMI, 11.3% were overweight, 8.1% were obese, and 4.8% were underweight (Fig. 1A). The waist criteria for metabolic syndrome were met by 13.3% women, 50% of whom were in menopause, and by 20% men.

Dyslipidemia was the second most common cardiovascular risk factor (17.7%) after smoking (19.4%), but only 63.3% of self-declared dyslipidemic participants were on a statin, and none was taking fibrates or nutraceuticals. Diabetes was reported by 3.2% of participants, of whom only one was on antidiabetic medications. No participants declared a history of CKD and CVD.

Among women, 16.6% were in menopause, 6.6% reported being on hormonal replacement therapy, and 6.6% reported taking oral contraceptives.

3.2 Lifestyle Factors

Globally, most participants reported regular physical activity (79%) and were non-smokers (74.2%). Specifically, most women (60%) reported moderate to high physical activity (Fig. 2A), while a similar proportion of men (63%) were sedentary or reported only low-intensity exercise (Fig. 2B). One in two women (53%) and 38% of men were on a low-salt diet (Fig. 2).

Most current/former smokers belonged to the third (39–58 years) and fourth (> 58 years) highest age quartiles (Fig. 1B).

Nearly 9 in 10 participants (87.1%) reported no or only sporadic alcohol consumption.

3.3 Blood Pressure Profile

As expected, mean BP tended to increase with age (Supplementary Table 1).

No differences in mean BP were observed based on the recording time (morning; afternoon), fasting status, recent coffee consumption or cigarette smoking, and conference-related commitments (Supplementary Figs. 1–4). More than one in 3 participants (37.1%) reported night shifts, with the last shift occurring within the previous 72 h among 30.4%. Their mean BP and HR did not differ

Table 1 Overall and sex-stratified demographic and clinical characteristics of participants in the study.

	Overall (*N*. 62)	Women (*N*. 30)	Men (*N*. 32)	*p* value
Age, mean (SD)	43.19 (14.78)	40.67 (12.20)	45.56 (16.70)	0.195
Caucasian (%)	62 (100.0)	30 (100.0)	32 (100.0)	NA
BMI, mean (SD)	23.91 (3.69)	22.57 (3.22)	25.16 (3.70)	0.005
Waist circumference, cm (SD)	85.86 (14.05)	77.85 (9.33)	93.07 (13.76)	< 0.001
Menopause (%)	5 (8.1)	5 (16.7)	0 (0.0)	0.052
Hormonal replacement therapy (%)	2 (3.2)	2 (6.7)	0 (0.0)	0.444
Pregnancy (%)	1 (1.6)	1 (3.3)	0 (0.0)	0.974
Contraceptive pill (%)	2 (3.2)	2 (6.7)	0 (0.0)	0.444
Fellow (%)	19 (30.6)	9 (30.0)	10 (31.2)	1
PhD student (%)	4 (6.5)	3 (10.0)	1 (3.1)	0.559
Researcher (%)	3 (4.8)	2 (6.7)	1 (3.1)	0.954
Consultant, academic (%)	5 (8.1)	0 (0.0)	5 (15.6)	0.073
Consultant, clinical (%)	12 (19.4)	6 (20.0)	6 (18.8)	1
Retired (%)	1 (1.6)	0 (0.0)	1 (3.1)	1
Freelance (%)	9 (14.5)	5 (16.7)	4 (12.5)	0.917
Talk/poster (%)	22 (35.5)	9 (30.0)	13 (40.6)	0.543
Talk/poster, to give (%)	5 (8.1)	1 (3.3)	4 (12.5)	0.391
Talk/poster, given (%)	17 (27.4)	8 (26.7)	9 (28.1)	1
Night shifts (%)	23 (37.1)	13 (43.3)	10 (31.2)	0.471
Last night shift (%)				0.095
< 24 h	25 (52.1)	8 (38.1)	17 (63.0)	
> 72 h	17 (35.4)	11 (52.4)	6 (22.2)	
24–72 h	6 (12.5)	2 (9.5)	4 (14.8)	
Smoking habits (%)				0.507
Former	4 (6.5)	1 (3.3)	3 (9.4)	
Never	46 (74.2)	22 (73.3)	24 (75.0)	
Current	12 (19.4)	7 (23.3)	5 (15.6)	
Alcohol (%)				0.032
Often	8 (13.1)	1 (3.4)	7 (21.9)	
Never	16 (26.2)	11 (37.9)	5 (15.6)	
Seldom	37 (60.7)	17 (58.6)	20 (62.5)	
Diabetes (%)	2 (3.2)	0 (0.0)	2 (6.2)	0.501
CVD (%)	0 (0)	0 (0.0)	0 (0)	NA
Dyslipidemia (%)	11 (17.7)	5 (16.7)	6 (18.8)	1
CKD (%)	0 (0)	0 (0.0)	0 (0)	NA
Hypertension history (%)	7 (11.3)	2 (6.7)	5 (15.6)	0.476
Hyperuricemia (%)	1 (1.6)	0 (0.0)	1 (3.1)	1
Family history of CVD (%)	24 (38.7)	14 (46.7)	10 (31.2)	0.325
Family history of hypertension (%)	41 (66.1)	22 (73.3)	19 (59.4)	0.372
Family history of dyslipidemia (%)	30 (48.4)	17 (56.7)	13 (40.6)	0.313
Antiplatelet agents (%)	2 (3.2)	1 (3.3)	1 (3.1)	1
Statin (%)	7 (11.3)	3 (10.0)	4 (12.5)	1
Fibrates (%)	0 (0)	0 (0.0)	0 (0)	NA
Nutraceuticals (%)	0 (0)	0 (0.0)	0 (0)	NA
Oral antidiabetic drugs (%)	3 (4.8)	1 (3.3)	2 (6.2)	1
GLP1RA or SGLT2i (%)	0 (0)	0 (0.0)	0 (0)	NA
Insulin (%)	0 (0)	0 (0.0)	0 (0)	NA
Steroids (%)	0 (0)	0 (0.0)	0 (0)	NA
NSAIDS (%)	0 (0)	0 (0.0)	0 (0)	NA
UA-lowering agents (%)	0 (0)	0 (0.0)	0 (0)	NA
Physical activity (%)				0.140

Table 1 (continued)

	Overall (*N*. 62)	Women (*N*. 30)	Men (*N*. 32)	*p* value
Intense	5 (8.1)	3 (10.0)	2 (6.2)	
Moderate	25 (40.3)	15 (50.0)	10 (31.2)	
None	13 (21.0)	7 (23.3)	6 (18.8)	
Little	19 (30.6)	5 (16.7)	14 (43.8)	
Low-salt diet (%)	28 (45.2)	16 (53.3)	12 (37.5)	0.319
BP measured in the afternoon (%)	36 (58.1)	17 (56.7)	19 (59.4)	1
Fasting > 8 h when measured BP (%)	17 (27.9)	9 (30.0)	8 (25.8)	0.937
Coffee < 3 h when measured BP (%) (%)	39 (63.9)	19 (63.3)	20 (64.5)	1
Smoked < 1 h when measured BP (%)	5 (8.1)	3 (10.0)	2 (6.2)	0.940
Mean sitting SBP, mmHg (SD)	120.1 (13.3)	112.8 (10.6)	126.9 (12.2)	< 0.001
Mean sitting DBP, mmHg (SD)	74.9 (10.2)	72.2 (8.8)	77.5 (10.9)	0.040
Mean sitting HR, bpm (SD)	73.5 (15.4)	74.3 (15.7)	72.7 (15.6)	0.680
1-min. standing SBP, mmHg (SD)	122.69 (15.39)	115.53 (13.57)	129.61 (13.95)	< 0.001
1-min. standing DBP, mmHg (SD)	80.64 (10.23)	77.20 (8.19)	83.97 (11.01)	0.009
1-min. standing HR, bpm (SD)	80.21 (15.79)	81.30 (15.80)	79.16 (15.96)	0.601
3-min. standing SBP, mmHg (SD)	122.54 (13.96)	115.87 (12.53)	129.00 (12.27)	< 0.001
3-min. standing DBP, mmHg (SD)	80.75 (10.49)	78.33 (9.31)	83.10 (11.18)	0.076
3-min. standing HR, bpm (SD)	81.54 (15.97)	81.53 (16.27)	81.55 (15.93)	0.997

SBP systolic blood pressure, *DBP* diastolic blood pressure, *HR* heart rate, *SD* standard deviation, *BMI* body mass index, *CVD* cardiovascular disease, *CKD* chronic kidney disease, *GLP1RA* glucagone-like peptide-1 receptor agonist, *SGLT2i* sodium-glucose transporter-2 inhibitor, *NSAIDS* non-steroidal anti-inflammatory drugs, *UA* uric acid.

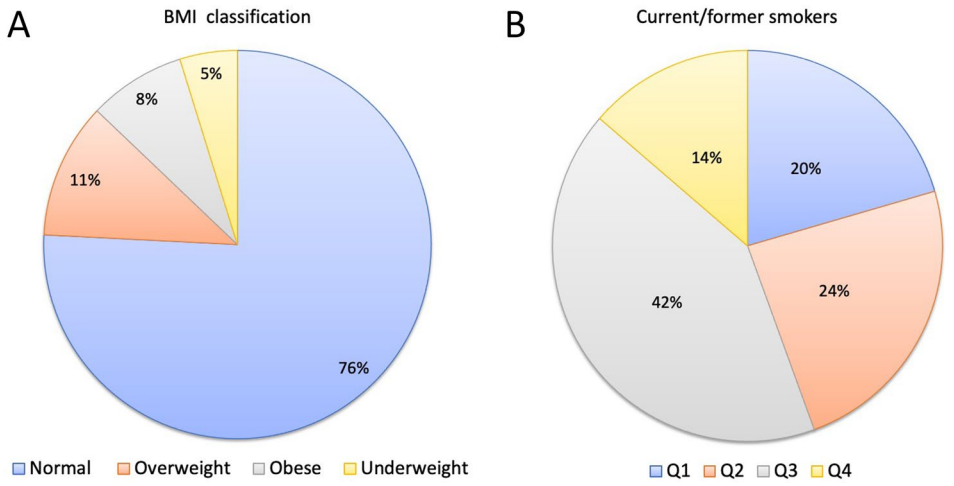

Fig. 1 Distribution of participants (%) based on BMI category (**A**) and self-reported current/former smoking habits across age quartiles (**B**). Underweight: BMI < 18.5; normal weight: BMI 18.5–24.9; overweight: BMI 25–29.9; obese: BMI ≥ 30. For age quartiles: Q1: < 31 years; Q2: 31–38 years; Q3: 39–58 years; Q4: > 58 years.

compared with participants not reporting night shift; similarly, no differences in BP and HR profiles were observed based on the timing of last night shift (Supplementary Fig. 5).

Based on their measured BP values and self-reported information, the majority of self-declared normotensive participants (69.3%, 58.1% women) had normal to optimal BP values, while seven (11.3%, 28.6% women) had high-normal BP (Table 2). Additional five self-declared normotensive individuals (8.1%) had measured BP values suggestive of new hypertension (Table 2). The remaining seven participants (11.3% of total) reported a history of diagnosed hypertension (Table 2); of them, 2 individuals (28.6%) had uncontrolled BP based on the first BP goal of < 140/90 mmHg, and other two didn't achieve the further reduced age-adjusted BP goal, leading to a total of 57.1% self-reported hypertensive individuals not at target in terms of BP control (Supplementary Table 2). Notably, half participants with uncontrolled hypertension reported being not, or only partially, adherent to guidelines-directed lifestyle recommendations (Supplementary Table 2). The remaining 3 participants with self-reported hypertension were non-smokers and at least physically active (N.2) and/or on a low-salt diet (N. 2).

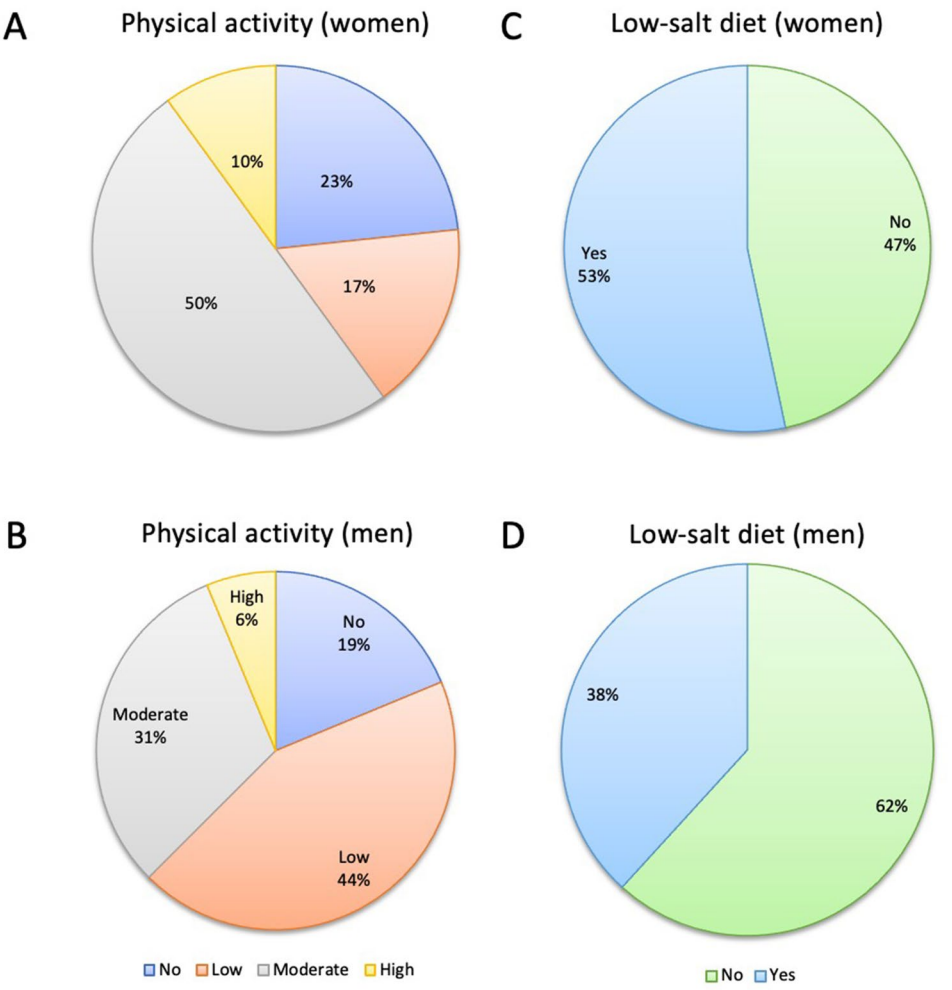

Fig. 2 Sex-stratified distribution of participants (%) based on self-declared physical activity (**A**, **B**) and salt intake (**C**, **D**).

In all, these findings indicate that 2/7 (28.6%) cardiovascular specialists were not, or were only partially, adherent to pharmacological and non-pharmacological guidelines-directed recommendations; that 3/7 individuals (42.8%) who were on an antihypertensive medication did not achieve the recommended/desirable BP goals; and that about one in 12 participants was unaware of possibly being affected by hypertension.

Globally, 3/61 (4.9%) and 23/61 (37.7%) participants had orthostatic hypo- and hypertension at 1 and/or 3 minutes after standing, respectively (Table 2).

Compared with sedentary men, male individuals reporting physical activity of any intensity had lower mean seated systolic BP and HR; similarly, physically active women had lower mean seated diastolic BP than sedentary ones (Table 3).

Mean BP tended to be lower in the absence of self-reported dyslipidemia, but the results did not reach statistical significance (Supplementary Table 3). However, the proportion of dyslipidemic participants among those with either self-declared hypertension, new hypertension, or high-normal BP (N. 5/19, 26.3%) tended to be higher than that observed among participants with normal or optimal BP (N. 6/43, 13.9%) (p=0.242) (Table 2).

4 Discussion

The results of this pilot study assessing the exposure to cardiovascular risk factors and the level of compliance to related guidelines-directed pharmacological and lifestyle recommendations among cardiovascular specialists indicate that a margin for improvement in terms of awareness and management exists even in this population category. Despite their professional engagement in the promotion of guidelines-directed preventive measures for cardiovascular health, in fact, about one in 4 individuals was a self-declared smoker, one in 5 reported being sedentary, and nearly 1 in 12 was not aware of their high BP values. Less than half of total participants, and none of those with new hypertension, were on a low-salt diet. Among those with a self-declared hypertension history, nearly one in 3

Table 2 Metabolic features and BP profiles based on BP category. See text for details.

	Hypertension history	New hypertension	High-normal BP	Normal-optimal BP	p-value
N. (% women)	7 (28.6)	5 (20)	7 (28.6)	43 (58.1)	
Mean sitting SBP, mmHg (SD)	129.5 (12.9)	142.9 (5.9)	131.6 (8.4)	114.2 (9.4)	< 0.001
Mean sitting DBP, mmHg (SD)	81.8 (9.1)	89.7 (5.7)	82.5 (6.6)	70.9 (8.0)	< 0.001
Mean sitting HR, bpm (SD)	73.3 (5.6)	65.3 (10.7)	78.5 (17.4)	73.6 (16.2)	0.559
1-min. standing SBP, mmHg (SD)	128.8 (14.8)	148.5 (4.5)	133 (10.4)	117.6 (12.8)	< 0.001
1-min. standing DBP, mmHg (SD)	82.8 (8.7)	95 (7.5)	85.7 (8.7)	78.1 (9,2)	0.004
1-min. standing HR, bpm (SD)	77 (7.4)	71.5 (10.9)	79.8 (15.8)	81.6 (16.6)	0.615
3-min. standing SBP, mmHg (SD)	132.6 (15.9)	139.7 (0.8)	132.3 (10.8)	117.7 (11.3)	< 0.001
3-min. standing DBP, mmHg (SD)	84.4 (10.1)	93 (7.6)	86 (7.6)	78.2 (9.7)	0.01
3-min. standing HR, bpm (SD)	77.8 (8.4)	70 (12.7)	83.7 (14.7)	82.8 (16.6)	0.418
Waist circumference, cm	107.4 (10.1)	89.6 (8.7)	93.6 (9.3)	80.3 810.8)	< 0.001
BMI, mean (SD)	29.8 (2.7)	24.1 (2.5)	25.3 (1.8)	22.7 (3.1)	0.001
Dyslipidemia	1	2	2	6	0.433
Diabetes	2	0	0	0	NA
Hyperuricemia	1	0	0	0	NA
Current smokers	1	1	1	9	0.959
Menopause	1	1	1	2	0.499
Family history for hypertension	6	3	6	26	0.376
Family history for CVD	2	2	2	18	0.852
Family history for dyslipidemia	2	3	4	21	0.662
ACE-inhibitors	0	–	–	–	NA
ARB	4	–	–	–	NA
CCB	1	–	–	–	NA
Beta blockers	1	–	–	–	NA
Thiazide diuretics	2	–	–	–	NA
Statins	1	0	2	3	NA
Antiplatelets	0	1	0	1	NA
Aldosterone antagonist, loop diuretic, alpha-litic	0	0	0	0	NA
UA-lowering agents	0	0	0	0	NA
Fibrates, nutraceuticals	0	0	0	0	NA
Other oral antidiabetic	1	0	0	2	NA
Sedentary lifestyle	3	1	1	8	0.501
Low-salt diet	4	0	2	22	NA
Coffee < 3 h	5	5	2	27	NA
Smoked < 1 h	0	0	1	4	NA
1-min. orthostatic hypotension	0	0	0	1	NA
3-min. orthostatic hypotension	1	0	1	1	NA
Orthostatic hypotension, total	1	0	1	1	NA
1-min. orthostatic hypertension	1	1	1	13	0.682
3-min. orthostatic hypertension	1	0	1	17	NA
Orthostatic hypertension, total	2	1	1	19	0.343

SBP systolic blood pressure, *DBP* diastolic blood pressure, *HR* heart rate, *SD* standard deviation, *BMI* body mass index, *CVD* cardiovascular disease, *ARB* angiotensin receptor blocker, *CCB* calcium channel blocker, *UA* uric acid.

were not, or were only partially, adherent to pharmacological and non-pharmacological guidelines-directed recommendations, and failure to achieve BP goals was documented in nearly half of treated hypertensive individuals. Dyslipidemia was the second most common self-reported cardiovascular risk factor after smoking, it was more common in the presence of high BP, and it was left untreated by about 4 in 10 individuals.

Table 3 Sex-stratified mean sitting BP and HR of participants based on the degree of physical activity.

	Women			Men		
	Physical activity (any intensity)			Physical activity (any intensity)		
	Yes (N. 24)	No (N. 7)	P-value	Yes (N. 27)	No (N. 6)	P-value
Mean sitting SBP, mmHg (SD)	114.6 (11.7)	113.9 (12.5)	0.820	127 (11.6)	135.5 (16.7)	**0.012**
Mean sitting DBP, mmHg (SD)	73.9 (8.6)	83.6 (22.2)	**0.003**	78 (10.3)	81.9 (13.8)	0.173
Mean sitting HR, bpm (SD)	74.1 (15.4)	75.9 (17.4)	0.650	70.4 (14.1)	82.9 (20.3)	**0.002**
Mean standing SBP, mmHg (SD)	115.1 (12.7)	117.6 (14.1)	0.541	128 (11.4)	134.8 (17.9)	0.102
Mean standing DBP, mmHg (SD)	78.2 (8.6)	76.5 (9.1)	0.538	83.6 (10.7)	83.2 (12.8)	0.899
Mean standing HR, bpm (SD)	80.1 (15.1)	85.6 (18.3)	0.267	78.6 (13.8)	87.8 (21.7)	0.068

Significant P-values ($p < 0.05$) are reported in bold

SBP systolic blood pressure, *DBP* diastolic blood pressure, *HR* heart rate, *SD* standard deviation.

It must be noted that, with a median age of 38 years and only about 13% individuals aged 60 years and above, our small study population was relatively young, thereby possibly explaining some of the observed features, including the low prevalence rate of low-salt diet, in agreement with previous population surveys [13]. This result is indeed in line with national data showing that, despite a significant reduction in salt intake of about 12% over 10 years from 2008 to 2018, limiting salt intake to < 5 g/day as recommended by cardiovascular prevention guidelines [9] and the World Health Organization [18] is still far to be achieved in Italy, independent of sex, age group, BMI category, geographical region, and education levels [19]. In the years 2018–2019, in fact, only 9% and 23% of Italian men and women aged 35–74 years reported consuming < 5 g of salt per day, respectively [19]. However, the benefit of a sodium intake not exceeding 2 g/day applies to the general European adult population, both in terms of safety and of effectiveness in reducing the risk of future CVD [20].

Interestingly, smoke was the first modifiable risk factor in the examined population, with a prevalence of 19.4% that is in line with recent national data [21, 22]. While no sex difference was observed in terms of smoking habits, most current or former smokers belonged to the two highest age quartiles, which is in positive contrast with recent national epidemiological data reporting a peak prevalence of tobacco smoke in the age range 20–24 years in 2018 [23], as well as with previous national survey data [13]. Globally, the finding is in agreement with a recent meta-analysis showing a prevalence of smoking among physicians as high as 21% [24].

Dyslipidemia was the second most prevalent risk factor in the examined population. In keeping with the strong pathophysiological correlation between hypertension and hypercholesterolemia and in agreement with epidemiological evidence [13, 25], we found that dyslipidemia tended to be about twice more common among participants with pre-existing or new hypertension or with high-normal BP than it was in the presence of optimal/normal BP. Mechanistically, it was reported that hypercholesterolemia increases the stability of the type 1 angiotensin II receptor (AT1) messenger RNA (mRNA), thereby conditioning its hyper-expression in vascular cells with an exaggerated response to angiotensin II that, in turn, promotes or exacerbates hypertension [26, 27]. In keeping with this, significantly higher arterial stiffness was reported in association with hypercholesterolemia [28]. Sartans were, indeed, the most reported antihypertensive medication among treated hypertensive participants in our pilot study.

The poor awareness of hypertension and hypercholesterolemia is relatively frequent in the general population. A small study on a wealthy general population of Northern Italy shown that only 50–60% of the examined individuals were aware of their elevated total serum cholesterol and their high BP [25]. In a survey involving 3956 Italian pharmacies, the prevalence and awareness of modifiable/non-modifiable cardiovascular risk factors were assessed among over 22,000 Italian pharmacy customers [13]. Hypertensive participants were 48.6% of total and they displayed a greater prevalence of self-reported hypercholesterolemia, confirming the association between the two cardiovascular risk factors. In this study, 9.2% of self-declared normotensive participants were reclassified as hypertensive after BP measurement, and only 38.9% of treated hypertensive participants achieved the age-adjusted 2018 ESC/European Society of Hypertension (ESH) guidelines-recommended BP target [13]. In our population, 42.8% of treated hypertensive individuals were at BP goal according to the age-adjusted 2021 ESC guidelines targets [9]. Our findings might suggest a slightly better BP control among cardiovascular health professionals than in the general population, but the comparison might be biased by sample size issues and different demographic features, among other factors.

In our study, women showed a healthier lifestyle behavior than men in terms of physical activity and salt intake.

Indeed, BMI and waist circumference, an important sign of visceral obesity, were significantly higher in men than women. As a result, women had significantly lower mean BP than men. Interestingly physical activity of any intensity was able to significantly reduce diastolic BP in women and systolic BP and HR in men. According to our findings, a prospective cohort study on metabolic, behavioral, and psychosocial risk factors and CVD in women compared with men from 21 high-income, middle-income, and low-income countries has found that a higher proportion of men were current or former smokers as well as more physically inactive than women [29]. The authors conclude that women had a more favorable cardiovascular risk profile than men, especially at younger ages [29].

Main limitations of the study include the small sample size, the use of self-reported data, the single BP measurement that does not allow to ascertain or rule out hypertension diagnosis, the possible bias in measured BP values introduced by the setting where the survey was conducted, and the lack of data on treatment compliance. However, BP and waist circumference were assessed with standard methods, validated BP measurement devices were used, and the collected evidence contributes to fill a knowledge gap relative to the specific population examined. As this was a pilot study with the objective of proof-of-concept, we felt that these preliminary data will be useful for designing a larger study that will be planned in concomitance with the 32nd ESH Meeting, to be held in 2023 in Milan.

In conclusion, despite their specific professionality, the prevalence of major modifiable/non modifiable cardiovascular risk factors and the extent of self-reported engagement in lifestyle-related and pharmacological treatment strategies in an exploratory sample of cardiovascular specialists suggest the need for a net improvement in terms of both awareness and management also in this population. This pilot research anticipates larger studies during future national and international conferences.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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