


Prevalence of hypertension and associated factors in female prison correctional officers in a national sample in Brazil

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Abstract

Objectives: To estimate hypertension prevalence and associated factors among female correctional officers (FCO) in female Brazilian prisons.

Methods: Cross-sectional, analytical study conducted in 15 female prisons in all five Brazilian regions between January 2014 and December 2015. The study population consisted of correctional officers with at least 6 months in the position. The sampling included 40% of FCO present in the prison during data collection, yielding 295 FCOs. Data were collected via *Audio Computer-Assisted Self-Interview*. A physical examination of participants was conducted including blood pressure, weight, and waist and hip circumference. The *Odds Ratio* and confidence intervals for independent factors were estimated.

Results: Hypertension prevalence in correctional officers was 37.9%, (95% CI 32.1-44.0). Hypertension was associated with obesity (95% CI = 1.884-9.947), cardiovascular disease (95% CI = 3.348-16.724), and participation in the specific training course for the relevant position (95% CI = 1.413-9.564).

Conclusions: While findings, except for the last factor, are not novel, this is the first such study conducted in Brazil. Hypertension prevalence among this pool of all female correctional officers is higher than in the average population, and FCOs associate this with the prison environment. Current training does not appear to address this problem. Especially since prison populations are growing in Brazil, this problem needs to be addressed for the health of the FCOs and the prisoners in their care.

KEYWORDS

correctional officers, hypertension, occupational health, prison guards, prisons

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1 | INTRODUCTION

The labor market for women has expanded and evolved from the 1980s. Despite women's labor achievements, there are still challenges as women occupy positions formerly reserved for men, especially in developing countries. Women are still responsible for domestic tasks and children, and the addition of other jobs only adds to chronic health problems in women.¹

One group that requires attention are female correctional officers (FCO), whose jobs are marked by challenges, stigma, danger, violence, and low social status. In Brazil, there are too few FCO for the superpopulation of existing prisoners.² Thus, once women assume the role of CO, the weight of responsibility for prisoner care and fear of violence is added to their other roles making them more susceptible to chronic illness.³

As documented by the Statistical Information System of the Penitentiary System (INFOPEN), Brazil has the third largest prison population in the world, with more than 773 151 prisoners, behind only the United States of America (2 121 600) and China (1 649 804).^{4,5} The National Prison Information Survey documented 78 163 FCO (64 456 men and 13 707 women) in Brazil in 2016, with an average of eight prisoners for each FCO, three more than required by Resolution No. 1 of 2009 of the National Policy Council Criminal and Penitentiary (CNPCCP).^{6,7} In addition, in the second half of 2018, the occupancy rate of Brazilian prisons exceeded 190%, reflecting unhealthy conditions,⁶ and adding to the biological and social factors shared by FCOs and female prisoners, such as family roles.⁸ This adds to the physical and mental exhaustion of the FCOs, also leading to the development of chronic non-communicable diseases (CNCDS).

Among CNCDS, systemic arterial hypertension (SAH) stands out. SAH has a relatively high prevalence in the general population, and is an important concern for global public health.^{9,10} FCO working conditions include factors that trigger SAH, such as night shifts, irregular work shifts, reduced physical activity time, long sitting periods, and occupational stress.^{3,11} These working conditions and the available literature led us to explore the hypothesis that inherent structural factors related to work in prisons is associated with SAH. The objective of this study is to estimate the prevalence of hypertension among FCO, the first such national study of hypertension among FCO in Brazil.

2 | METHODS

2.1 | Study type and location

This is a nationwide cross-sectional analytical study included in the project entitled *national health inquiry for the female*

penitentiary population and prison unit workers. Data collection occurred between January 2014 and December 2015 in 15 female prisons in the states of Pará and Rondônia (North Region), Ceará (Northeast region), the Federal District and Mato Grosso (Midwest Region), São Paulo and Minas Gerais (Southeast Region) and Paraná and Rio Grande do Sul (South Region).

2.2 | Population and sampling

The study population composed of female FCO in the Brazilian prison system, aged between 21 and 69 years, with at least 6 months or more experience as FCO in the prison system and agreeing to participate in the study. Because the overall study was focused on female prisoners and due to the difficulty of finding official data on the number of female COs in Brazil when the research was conducted, the sampling frame consisted of the imprisoned female population. For the purpose of this research, the two states in each political-administrative Brazilian region with the highest female prison population were selected.⁶ Selected prisons were stratified according to their location (state capital, metropolitan region, or interior) and number of prisoners. Only those prisons with more than 75 prisoners were included in the sample due to their obligation to offer health-care services which were a target of the research.¹²

We established a 40% sample of FCO in larger prisons as our target for recruitment. In prisons where FCO numbered 33 or fewer, all FCOs were invited to participate. FCOs on holiday, leave, or who had less than 6 months on the job were excluded from the sample.

When samples were drawn in prisons, the *Intemodino Group* random number generator was used to select participants from the prison list of FCOs. A total of 295 FCOs were interviewed.

2.3 | Collected instruments and variables

Data were collected via a self-administered questionnaire including sociodemographic, labor, and clinical and health variables using *Audio Computer-Assisted Self-Interview – ACASI* technology on tablets, providing interviewees more privacy and confidentiality.¹³ Besides the questionnaire, during data collection, a physical examination of all participants was conducted. This exam consisted of BP, height and weight for body mass index (BMI) calculation, and waist and hip circumference measurements.

Variables were classified into three main groups: sociodemographic, labor, and clinical/health. Among the sociodemographic variables, we measured and classified age (>50 years, 30-50 years, ≤30 years); race/color (brown or

black, white or yellow); marital status (single or without a stable partner, married or in stable union), children (yes, no); number of children; currently studying (yes, no); education level (primary or secondary education, complete/incomplete higher education, post-graduate); main family income source (yes, no); current or previous smoking (yes, no); and alcohol intake (yes, no). Among labor variables: work at another prison unit (yes, no); time (in years) working as a correctional officer (5 years or less, between 6 and 10 years, more than 10 years); took the specific training for correctional officers (yes, no); and consider working in the prison unit stressful (yes, no).

The health variables studied were as follows: self-reported health (very good, good, average, bad); private health-care plan (yes, no); cardiovascular diseases (yes, no); hypercholesterolemia (yes, no); health services at work (never took any health test at the prison unit; already had BP measured by a health professional); sedentary lifestyle (yes, no); exercises or practices sports regularly (yes, no); time devoted to physical activities weekly (≥ 150 minutes/week, ≤ 150 minutes/week); and regular intake of fruits/vegetables/greens and beans; raw greens or vegetables; cooked greens or vegetables; non-recommendable food intake; score SRQ (< 7 , ≥ 7)¹⁴; use of oral or injectable contraceptives (yes, no); still menstruate (yes, no); mother, father, or brother has/had hypertension, diabetes, high cholesterol, diabetes, stroke or cerebral thrombosis, angina, or heart attack (yes/no for each).

Physical activity time was divided into ≥ 150 minutes and ≤ 150 minutes per week according to the criteria established by the Surveillance System for Chronic Disease Risk and Protective Factors through Telephone Survey.¹⁵ The time in hours per day dedicated to watching TV was classified into two levels (< 3 hours and > 3 hours). Using these two scores, the FCO was defined as sedentary (time of weekly physical activity ≤ 150 minutes and/or ≥ 3 hours a day spent watching TV) or non-sedentary (time of weekly physical activity ≥ 150 minutes and/or ≤ 3 hours a day watching TV).¹⁶ With respect to the dietary standards classification into healthy and unhealthy lifestyles, we considered unhealthy whenever participants did not regularly consume beans, vegetables, and/or fruits as recommended by the Ministry of Health.¹⁵

BMI was calculated ($\text{BMI} = \text{weight}/\text{height}^2$) and classified into normal or low (≤ 25), overweight (> 25 and < 30), and obese (≥ 30).¹⁷ The abdominal circumference was grouped according to the Ministry of Health parameters (< 80 cm and ≥ 80 cm) and the age-adjusted waist-hip ratio was divided into low, moderate, and high/very high.¹⁸

In this study, those patients who tested SAH positive (based on prior medical diagnosis) were considered hypertensive, as well as those who matched one of the following criteria: continuous use of antihypertensive medication; BP values $\geq 130/85$ mmHg; or SBP ≥ 140 mmHg (casual

measurement).¹⁹ BP measurement was conducted by trained researchers on seated FCOs using an aneroid sphygmomanometer with a cuff compatible to each patient's arm at the level of heart according to the standard procedure proposed in the 4th Brazilian Guidelines for Hypertension.¹⁹ Due to operational regulations in the prison units, time allocated to interview correctional officers was limited and this made the recommendation to conduct the BP measurements three times impracticable and only one measurement per patient was performed.

2.4 | Data analysis

Data were analyzed using SPSS® software version 20.0 and STATA® v.15.0. Point and interval estimates, as well as bivariate and multivariate association analyses, were carried out by applying the STATA® complex sample survey module considering the inverse probability weighting obtained as chosen by the COs per each sampling stage. The significance level applied to statistical tests was 5%. *Odds Ratio* and Confidence Intervals for independent factors were estimated. Those factors that resulted in $P \leq .20$ in the bivariate analysis²⁰ were selected for the logistic regression. In the final model, those with $P < .05$ or that proved to be confounding factors were maintained. The research was approved by the Ceará Federal University (UFC) Research Ethics Committee through protocol n° 188,211. All participants read and signed an Informed Consent Agreement (ICA).²¹

3 | RESULTS

Table 1 presents socioeconomic, demographic, and labor characteristics, as well as arterial hypertension prevalence in FCO. The mean age was 38.1 (± 8.52 years); 60% were in the age range between 31 and 45 years; 64.3% (95% CI: 58.6-69.6) had complete or incomplete higher education or were taking a post-graduate course; a little more than 60% (95% CI: 54.1-66.2) had at least one child; 44.9% (95% CI: 39.0-51.0) were the main source of family income; 73% (95% CI: 68.8-77.5) had worked at another prison unit; the majority (87.6%, 95% CI: 83.2-91.1) had attended the specific training course for COs; and 80% (95% CI: 75.5-85.3) considered the work at the prison unit risky and stressful.

The prevalence of arterial hypertension showed a discrepancy between self-reported results and the values obtained directly through BP measurement. Self-reported SAH by the FCO was 15.1% (95% CI: 11.1-20.2), usually based on prior diagnosis of hypertension in the health system. Actual observed hypertension was much higher: a prevalence of 37.9% (95% CI: 32.1-44.0), an increase of 250% over self-report, was observed (Table 1).

TABLE 1 Socioeconomic, demographic, and labor characteristics and SAH prevalence in Correctional Officers in Brazilian Prisons, 2014-2015

Variable	(%) ^a	95% CI ^a
Age		
≤30 years	15.3	11.8-19.8
31-50 years	73.4	68.0-78.1
31-36	30.0	24.8-35.7
36-40	22.4	17.8-27.8
40-50	21.0	16.4-26.6
≥50 years	11.3	8.1-15.6
Color/race		
Black	14.8	11.0-19.6
Brown	44.1	38.4-50.0
White	37.7	32.5-43.1
Yellow	3.4	1.9-6.2
Education level		
Primary or secondary	35.7	30.4-41.4
Incomplete/complete higher education or post-graduate course	64.3	58.6-69.6
Currently studying		
No	76.6	71.2-81.3
Yes	23.4	18.7-28.8
Marital status		
Single or no stable partner	32.7	27.2-38.7
Married/stable union	67.3	61.3-72.8
Children		
No	39.9	34.8-45.9
Yes	60.1	54.1-66.2
Main family income source		
No	55.1	49.0-61.0
Yes	44.9	39.9-51.0
Smoke/smoked		
No	81.8	77.0-85.8
Yes	18.2	14.2-23.0
Alcohol intake		
No	67.7	61.7-73.1
Yes	32.3	26.9-38.3
Time (years) working as an officer		
≤5 years	45.8	40.2-51.5
6-10 years	31.6	26.6-37.1
>10 years	22.6	18.3-27.4
Worked at another prison unit		
No	27	22.5-32.0
Yes	73	68.0-77.5

(Continues)

TABLE 1 (Continued)

Variable	(%) ^a	95% CI ^a
Specific training for correctional officers before, during, or after starting to work at prison unit		
No	12.4	8.9-16.8
Yes	87.6	83.2-91.1
Consider working at the prison system		
Just risky	1.4	0.6-3.3
Just stressful	17.9	13.5-23.0
Risky and stressful	80.9	75.5-85.3
Arterial hypertension (self-reported)		
No	84.9	79.8-88.9
Yes	15.1	11.1-20.2
Arterial hypertension (blood pressure measurement + self-report)		
No	62.1	56.0-67.9
Yes	37.9	32.1-44.0

^aWeighted estimate.

The arterial hypertension prevalence was higher among officers aged over 50 (60.9%, 95% CI: 1.347-9.495), with primary or secondary education (50.2%, 95% CI: 1.313-3.815), who were the main family income source (45.4%, 95% CI: 1.032-3.002), had worked at another prison (41.4%, 95% CI: 0.980-3.360), had worked as a CO for more than 10 years (56.0%, 95% CI: 1.523-5.964), and had participated in a specific training for the position (41.0%, 95% CI: 1.297-8.157) (Table 2).

With regards to behavioral, clinical, and health characteristics, hypertension prevalence was higher among FCO who considered their health to be average or poor (50.3%, 95% CI: 1.314-6.291), reported a cardiovascular disease (80.5%, 95% CI: 4.643-23.106), was never examined in the prison (43.5%, 95% CI: 1.136-3.445), said to have a family history of hypertension (43.5%, 95% CI: 1.253-4.133), was obese (62.5%, 95% CI: 3.040-13.587), had abdominal circumference larger than recommended (41.8%, 95% CI: 1.868-11.49), or had a very high age-adjusted waist-hip ratio (44.7%, 95% CI: 1.413-8.673) (Table 3).

In the logistic regression, with the introduction of potentially associated variables, interaction and confounding were not found. A statistically significant association was found between SAH and having participated in the specific training course for COs, obesity, and reporting a cardiovascular condition (Table 4).

4 | DISCUSSION

The prevalence of SAH in FCO in this study was shown to be higher than in the general population,³ and in other occupational categories,²² especially if one takes into

TABLE 2 Hypertension prevalence in COs according to their socioeconomic, demographic, and labor characteristics. Brazil, 2014-2015

Variable	(%)	Yes	No	P-value	OR	95% CI
Age						
>50 years	11.3	60.9	39.1	0.021	3.57	(1.347-9.495)
30-50 years	73.4	36.1	63.9		1.29	(0.633-2.652)
≤30 years	15.3	30.4	69.6		1	
Color/race						
Brown or black	58.9	41.1	58.9	0.235	1.37	(0.810-2.349)
White or yellow	41.1	33.6	66.4		1	
Marital status						
Single or no stable partner	32.7	38.2	61.8	0.915	1.03	(0.589-1.804)
Married/stable union	67.3	37.5	62.5		1	
Children						
No	40.0	29.6	70.4	0.032	1	
Yes	60.0	43.4	56.6		1.82	(1.051-3.165)
Number						
No children	40.0	29.6	70.4	0.099	1	
1 child	26.7	39.8	60.2		1.57	(0.799-3.083)
≥2 children	33.4	45.1	54.9		1.95	(1.000-3.631)
Currently studying						
No	76.6	43.0	57	0.004	1	
Yes	23.4	20.4	79.6		0.34	(0.161-0.724)
Education level						
Primary or secondary	35.7	50.2	49.8	0.003	2.23	(1.313-3.815)
Complete/incomplete higher education or post-graduate course	64.3	31.1	68.9		1	
Main family income source						
No	55.1	32.1	67.9	0.037	1	
Yes	44.9	45.4	54.6		1.76	(1.032-3.002)
Smoke/smoked						
No	81.8	36.0	64	0.099	1	
Yes	18.2	48.5	51.5		1.67	(0.903-3.11)
Alcohol intake						
No	67.7	35.6	64.4	0.395	1	
Yes	32.3	41.0	59.0		1.25	(0.742-2.124)
Worked at another prison unit						
Yes	73.0	41.4	58.6	0.056	1.81	(0.980-3.360)
No	27.0	28.0	72.0		1	
Time (years) working as an officer						
5 years or less	45.8	29.7	70.3	0.005	1	
6-10 years	31.6	37.3	62.7		1.40	(0.766-2.579)
More than 10 years	22.6	56.0	44.0		3.01	(1.523-5.964)
Specific training course for correctional officers before, during, or after starting to work at prison unit						
No	12.4	17.6	82.4	0.009	1	
Yes	87.6	41.0	59.0		3.25	(1.297-8.157)
Consider work at prison unit stressful						
No	16.9	42.7	57.3	0.54	1	
Yes	83.1	37.5	62.5		0.80	(0.398-1.622)

TABLE 3 SAH prevalence according to clinical and health characteristics of correctional officers in Brazilian prison units. Brazil, 2014–2015

Variable	(%)	Yes	No	<i>P</i> -value	OR	95% CI
Health state						
Very good	32.5	26.1	73.9	0.022	1	
Good	49.7	41.3	58.7		1.99	(1.033–3.866)
Average/poor	17.8	50.3	49.7		2.87	(1.314–6.291)
Health-care coverage						
No	17.3	29.9	70.1	0.252	1	
Yes	82.7	39.2	60.8		1.51	(0.741–3.087)
Cardiovascular disease						
No	95.5	28.4	71.6	<0.001	1	
Yes	4.5	80.5	19.5		10.35	(4.643–23.106)
Hypercholesterolemia						
No	88.1	37.8	62.2	0.596	1	
Yes	11.9	42.9	57.1		1.23	(0.562–2.720)
When working on this or other prison unit have you been in any of these situations?						
Never had any health control performed						
No	63.7	43.5	56.5	0.015	1.97	(1.136–3.445)
Yes	36.3	28	72		1	
Had blood pressure measured by a health professional						
No	40.4	27.9	72.1	0.008	1	
Yes	59.6	44.6	55.4		2.07	(1.208–3.577)
Practice physical exercise or sports regularly						
No	43.2	42.6	57.4	0.176	1	
Yes	56.8	34.1	65.9		0.69	(0.413–1.177)
Total time of physical activity (min.) of weekly practice						
≥150 min/week	41.2	33.5	66.5	0.276	0.73	(0.414–1.289)
<150 min/week	58.8	40.8	59.2		1	
Regularly eat fruits,						
Vegetables, greens, and beans						
No	65.6	36.9	63.1	0.639	1	
Yes	34.4	40.1	59.9		1.14	(0.650–2.014)
Raw vegetables or greens						
No	44.6	39	61	0.805	1	
Yes	55.4	37.4	62.6		0.93	(0.555–1.580)
Cooked greens or vegetables						
No	44.6	32.8	67.2	0.123	1	
Yes	55.4	42.5	57.5		1.51	(0.893–2.561)
Non-recommendable food intake						
No	14.6	28.1	71.9	0.166	1	
Yes	85.4	40.1	59.9		1.71	(0.793–3.728)
Mental disorders						
Score SQR 20						
<7	69.4	36	64	0.307	1	
≥7	30.6	42.9	57.1		1.33	(0.765–2.332)

(Continues)

TABLE 3 (Continued)

Variable	(%)	Yes	No	P-value	OR	95% CI
Reproductive life						
Use of oral/injectable contraceptives						
No/no contraceptive use	60.9	44.9	55.1	0.006	1	
Yes	39.1	26.7	73.3		0.44	(0.251-0.797)
Still menstruate						
No	15.5	51.9	48.1	0.052	1	
Yes	84.5	35.6	64.4		0.51	(0.258-1.012)
Family health						
<i>Mother, father, or brothers have/had</i>						
Hypertension						
No	31.6	25.3	74.7	0.006	1	
Yes	68.4	43.5	56.5		2.27	(1.253-4.133)
Diabetes						
No	66.4	34.1	65.9	0.099	1	
Yes	33.6	45.2	54.8		1.59	(0.914-2.77)
High cholesterol						
No	59.9	39.3	60.7	0.586	1	
Yes	40.1	35.7	64.3		0.85	(0.496-1.489)
Stroke or thrombosis						
No	89.6	36.9	63.1	0.376	1	
Yes	10.4	46.1	53.9		1.46	(0.626-3.422)
Angina or heart attack						
No	82.9	37.2	62.8	0.674	1	
Yes	17.1	40.6	59.4		1.15	(0.596-2.221)
Measurements						
BMI						
<25	36.4	20.6	79.4	<0.001	1	
25-30	38.5	35	65		2.07	(1.046-4.117)
≥30	25	62.5	37.5		6.42	(3.040-13.587)
Abdominal circumference						
<80	17.9	13.4	86.6	<0.001	1	
≥80	82.1	41.8	58.2		4.63	(1.868-11.49)
Age-adjusted waist-hip ratio						
Low/moderated	16.8	18.7	81.3	0.017	1	
High	35.8	34.7	65.3		2.29	(0.870-6.073)
Very high	47.4	44.7	55.3		3.50	(1.413-8.673)

account the fact that the FCOs in this study are relatively young. These findings support the premise that structural factors associated with prison work are associated with SAH. In addition, there was a large difference between self-report and values obtained with direct BP measurement. Worldwide, hypertension remains the leading preventable cause of cardiovascular disease and death from all causes.²³ The rates of undetected hypertension are high in

all countries, regardless of income status, and only half of the hypertensive patients are aware of their diagnosis, and of these, less than a third manage to keep their BP under control.²⁴ Because it is predominantly asymptomatic, hypertension can be better detected through structured population screening programs or occasional or opportunistic measurement of BP.²⁴ In this regard, the discrepancy observed between the prevalence of self-reported SAH and

TABLE 4 Factors associated with SAH in correctional officers within Brazilian prison units. Brazil, 2014–2015

Variable	Net (95% CI)			Adjusted (95% CI)		
	OR	LI	LS	OR	LI	LS
Socioeconomic and demographic						
Current age						
>50 years	3.576	1.347	9.495	-	-	-
30–50 years	1.295	0.633	2.652	-	-	-
≤30 years	1	-	-	-	-	-
Education level						
Primary or secondary	2.238	1.313	3.815	-	-	-
Complete/incomplete higher education or post-graduate course	1	-	-	-	-	-
Today, are you the main family income source?						
No	1	-	-	-	-	-
Yes	1.76	1.032	3.002	-	-	-
Do you have children?						
No	1	-	-	-	-	-
Yes	1.824	1.051	3.165	-	-	-
Labor						
Time (years) working as an officer						
5 years or less	1	-	-	-	-	-
6–10 years	1.406	0.766	2.579	-	-	-
More than 10 years	3.014	1.523	5.964	-	-	-
Worked at another prison unit						
Yes	1.814	0.98	3.36	-	-	-
No	1	-	-	-	-	-
Have you taken any specific training for correctional officers before, during or after starting to work at the prison unit?						
No	1	-	-	1	-	-
Yes	3.253	1.297	8.157	3.676	1.413	9.564
Does a CO suffer violence at the prison unit at the moment?						
No	1	-	-	-	-	-
Yes	1.589	0.913	2.766	-	-	-
Self-reported health/clinical evaluations						
How do you rate your health state?						
Very good	1	-	-	-	-	-
Good	1.998	1.033	3.866	-	-	-
Average/poor	2.875	1.314	6.291	-	-	-
Have you had your blood pressure measured at the prison unit?						
No	1	-	-	-	-	-
Yes	2.079	1.208	3.577	-	-	-
Obesity (BMI)						
<25	1	-	-	1	-	-
25–30	2.075	1.046	4.117	2.048	0.967	4.339
≥30	6.427	3.04	13.587	4.329	1.884	9.947
Have you suffered from cardiovascular disease?						
No	1	-	-	1	-	-
Yes	10.358	4.643	23.106	7.483	3.348	16.724

BP values can be related to many factors: the organization of health services – in prisons and outside of them – genetic factors, predisposition to self-care for FCOs, lack of awareness of the disease and the health risks it produces, and difficulty in accessing health services. With regard to the latter, screening and regular comprehensive monitoring is recommended by the Brazilian Ministry of Health in Primary Health Care^{18,25} and the regulations for health in prison in Brazil⁶ of all chronic patients including hypertensive patients.

Studies conducted among COs in several countries showed that the tension, stress, psychological/emotional suffering, night shifts, and work overload are factors that can explain how the prison environment influences the health of the group in question.^{26,27} Generalized stress and stress in the workplace affect between 19% and 30% of employees in different sectors.²⁸ In prisons, this proportion grows, and about 41.2% of COs show signs of stress related to the type of work and environment in which they perform their duties.²⁹ Clearly, the effect of stress and exhaustion are more pronounced among COs when compared to other classes of workers, and are often associated with decreased satisfaction in life, difficulty in dealing with traumatic experiences, greater turnover, increased use of drugs and alcohol, and decreased physical health.³⁰ These findings support the hypothesis that the prison environment may have a direct influence on the hypertension in FCOs.

Participation in the training course for the role of FCO was found to be a risk factor for SAH. Prior to entering Brazilian prisons, FCOs must participate in specific training for the job, which involves exposing trainees to current FCOs and the situations and conditions of work they will face. In addition, the training attempts to address ill health on the job by providing tips for maintaining physical integrity, healthy lifestyles, as well as the importance of maintaining emotional balance.³¹ While the cross-sectional design of our study does not permit us to draw causal conclusions, our study documents that the course is associated with increased hypertension. While this study was not designed to evaluate the training course itself, the course does recount many of the different problems that might be faced on the job, such as prison revolts. For example, in early 2017, in just 15 days, a series of rebellions occurred in Brazil that resulted in the death of more than 130 detainees in eight states (Alagoas, Amazonas, Paraíba, Paraná, Santa Catarina, São Paulo, Rio Grande do Norte, and Roraima). In these revolts, prisoners and COs were taken hostage.³² It is worth noting that Brazilian FCOs work only in women's prisons and, although almost all of these events occur in men's prisons, the growth of the female prison population linked to drug trafficking, in particular,⁶ associating women with their partners who are often imprisoned at

the same time and who may be violent,³³ puts the physical integrity of FCOs at risk inside and outside the prison. Exposure to this type of information, at least on a *prima facie* basis, could trigger anxiety, and the purpose, content, role, and effect of participation in these courses deserve further investigation.

Obesity (BMI) and having cardiovascular disease (CVD) have also been shown to be risk factors for SAH, although they are not specific to FCO. Obesity is one of the main risk factors for CVD and an important public health problem, since it is linked to the development of multiple diseases, both acute and chronic.³⁴ Our findings (63% presented BMI \geq 30) are confirmed in research concerned with female prison staff in the interior of São Paulo state, which reported that 74% of those investigated were overweight or obese.³ These results were related to a poorly balanced diet and physical inactivity, thus, leaving FCO exposed to the development of many diseases, such as SAH.^{22,35} CVDs are the leading cause of death worldwide,³⁶ most of which can be prevented through attention to behavioral risk factors such as tobacco use, inadequate diet, obesity, physical inactivity, and harmful use of alcohol.³⁷ Reducing exposure to these factors can increase life expectancy for individuals, improve quality of life, and, consequently, minimize spending by governments and society in general. With respect to FCOs in Brazil, there are many factors that can contribute to the increase in weight gain and the development of CVD, among which are 24-hour shifts, long periods of sitting, and fear and anxiety contributing to occupational stress. Although there was no significant association among arterial hypertension, healthy eating, and physical activity in this study, these risks are well-known.^{36,38}

Among the limitations of this research, we highlight here our inability to measure blood pressure three times, as recommended by Brazilian and international guidelines for the diagnosis of SAH^{39,40}; primary dependence on self-reporting for many conditions; the cross-sectional design which limits interpretation; the difficulty of access to some prisons, excluding them from our study; as well as the reduced time for conducting interviews and evaluating the FCOs in general.

5 | CONCLUSIONS

This study showed that the prevalence of SAH among correctional officers is higher than in the general population and that it is probably associated with the work environment. SAH is just one health concern among countless problems that may affect this specific group of workers. It is quite possible that in the context of a major growth in the number of prisoners and the overpopulation of male and female prisons that create an environment for extremely violent rebellions, this situation may get even worse in the coming years, increasing turnover and dissatisfaction with the job. It is urgent

and necessary to develop policies and programs that promote better coping with the mental and physical health problems of both FCO and prisoners.

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DISCLOSURE

Approval of the research protocol: The Research Ethics Committee of Federal University of Ceará Ethics Committee reviewed and approved the aims and procedures of this study (protocol n° 188,211). *Informed consent:* Informed consent was obtained from all individual participants included in the study. *Registry of the study/trial:* N/A. *Animal studies:* N/A. *Conflict of interest:* The authors declare no conflict of interests for this article.

AUTHOR CONTRIBUTIONS

AZS substantially worked on the article, including analysis and interpretation of data, and writing of the manuscript; LRFSK designed and implemented the larger study; RMSM, RHMM, RJPN, MJMF, PFA, TMMM, DS, and CK contributed to analysis and interpretation of data. All authors worked on revising the manuscript and final edits.

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