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Hypertension, physical activity and other associated factors in military personnel: A cross-sectional study

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background: Hypertension is a major concern in public health. In the world population over 25 years of age, its prevalence is of 40%, and studies on the amount of physical activity (PA) related to hypertension in active military personnel are scarce. To estimate the prevalence of hypertension in the Brazilian Army military personnel and to explore the association of PA levels and other risk factors.

Material and methods: This is a cross-sectional study (N = 506). Self-reported prevalence of hypertension (outcome), PA and associated factors were examined (X^2, simple and multiple Poisson regression).

Results: Prevalence of hypertension was lower (9.7%) than in the general population and the expected associated factors, such as job stress and psychological distress, were not associated with hypertension. Job stress and psychological distress were not associated to hypertension. PA in sports/exercise in leisure (SEL) presented inverse association. The minimum amount of PA presented a cut-off point on SEL of 1,200 METmin/week.

Conclusions: In military, higher levels of SEL was related to lower prevalence of hypertension and the cut-off point found indicated that the minimum amount of PA to achieve a protective pattern is ~50min of PA of moderate to vigorous intensity (≥4METs) four times a week. Findings were discussed.

Key words: epidemiology, cardiovascular disease, exercise, elevated cholesterol, job stress, mental health.

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INTRODUCTION

Hypertension, a major public health concern and global problem, is related to the development of many other diseases, such as heart disease, cerebrovascular accident, renal failure, premature mortality [1], dementia [2], and cognitive impairment [3]. Defined by systolic blood pressure of ≥ 140 mmHg and/or diastolic pressure of ≥ 90 mmHg, hypertension affects much of the world's population over the age of 25 years (40%) [1]. According to the World Health Organization (WHO), the symptoms of hypertension rarely manifest in early stages; therefore, many people remain undiagnosed [1]. In Americas, the prevalence was 35%, with a higher prevalence in low-and middle-income populations, and the problem is getting worse due to weak health systems, leading to large numbers of individuals without a diagnosis and/or treatment [1].

Epidemiological data indicate that the main cause of death in Brazil between 1996 and 2011 was cardiovascular disease, with an annual rate of approximately 30% of total deaths [4]. Furthermore, the prevalence of hypertension presents great variability depending on the region (25–35%), and the rate of mortality due to hypertension and related deaths is 27.5% [5].

In military personnel, a study conducted in the United States demonstrated that hypertension was related to mortality due to atherosclerotic coronary and aortic disease and found a prevalence of 43.6% of these events among hypertensives [6]. Another study conducted among veterans noted that 89% of the 104 subjects with moderate aortic stenosis had hypertension [7]. Furthermore, those who were in active combat during conflict situations presented a 33% greater risk compared to those who were uninvolved in combat [8].

Among servicemen of the Brazilian Armed Forces, two studies that focused on hypertension were identified. The prevalence in the Air Force (N = 380) was 22%, higher than that found in the general population (12.7%) [9]. In the Army, a study conducted in a school for graduate officers (N = 426) found a prevalence of 5.63% [10].

The aetiology of hypertension in most cases (~90%) is nonspecific. It is a multifactorial disease that results from the interaction of genetic, environmental, and behavioural factors [11]. Among the environmental factors, one major source of stress is found in the workplace. The literature consistently shows that occupational stress is associated with hypertension [12]. Behavioural factors associated with hypertension are dietary habits (salt intake), smoking, and physical activity [5]. The latter has been included in all levels of prevention and treatment for cardiovascular and metabolic diseases, including hypertension [13]. Exercise helps to reduce the morbidity and mortality from these diseases [13], promoting beneficial vascular changes that reduce the endothelial dysfunction and arterial stiffness [14, 15], which are commonly present in the cases of disease in which there is excessive oxidative stress, such as type 2 diabetes, obesity, hypertension, and metabolic syndrome [16].

In this context, literature shows that aerobic and resistive (progressive) exercises promote significant reduction in blood pressure (systolic and diastolic) in adults [17]. The literature demonstrates that aerobic training programs of moderate to severe intensity, lasting 40 minutes for 3–5 times per week, and involving more than 800 MET-minutes per week, promote reduction in blood pressure [17]. Moreover, physical activity is also recommended to prevent and treat of dyslipidaemias [18].

Atherosclerosis is a chronic inflammatory disease with a multifactorial aetiology and is a process in response to inflammation of the endothelium, occurring mainly in the intima of arteries of medium and large calibre [18]. It is the leading cause of global deaths [19]. Dyslipidaemias are one of the main factors contributing to the development of cardiovascular diseases [19] and are also strongly associated with hypertension [5].

There are few studies regarding the health of military personnel in Brazil, indicating a need for more scientific research in this population of workers. In this context, there is a lacuna in knowledge on hypertension and associated factors. This study aimed to evaluate the association between the physical activity level, elevated cholesterol and other risk factors for hypertension in military personnel of the Brazilian Army.

MATERIAL AND METHODS

Design and study population

This cross-sectional, census type study was conducted among military personnel serving at a Brazilian army directorate and its subordinate military organisations: five barracks (N = 654). Data were collected from October 2009 to February 2010.

All principles governing research involving human beings were observed. Ethical approval of the Social Medicine Institute of the State University of Rio de Janeiro was registered in the Ministry of Health (CAAE 1368.0.000.259-09).

Measures

Data were collected through self-reported questionnaires on hypertension and elevated cholesterol (prior diagnosis by a physician), socioeconomic and demographic information, job stress, physical activity and health status. This methodology has been largely used in epidemiological studies [20–23]. In order to guarantee the quality of information, pre-test and pilot studies were carried out, through test-retest reliability assessment. Results showed high reliability with agreement ranging from substantial to perfect according to the classification of Landis & Koch [24].

Hypertension: The prevalence of hypertension (outcome) was self-reported, referring to prior diagnosis by a physician.

Elevated cholesterol: Elevated cholesterol was self-reported, referring to prior diagnosis by a physician.

Psychological distress: Psychological distress was evaluated using the Brazilian version [25] of the General Health Questionnaire (GHQ-12) [26]. Scores for individual items were coded as absent or present (0 or 1) and then summed. Total scores of 3 or more (out of 12) were considered as cases of psychological distress, according to the methodology of the construct.

Job stress: Job stress was assessed by the effort-reward imbalance model [27]. According to the model, an adverse work environment is characterised by a situation of high effort spent and low reward received, which exhibits a deficit of reciprocity that can lead to a state of active distress, evoking negative emotions [27]. The instrument, adapted and validated in Brazil [28], is comprised of 23 questions, and the results are expressed in scores that cover three facets: effort (E), reward (R), and overcommitment (OC). The total score (TS) is calculated as the ratio between effort and reward (E/R) plus OC, resulting in the formula TS = (E/R + OC).

Physical activity: Physical activity was assessed with the Baecke's Questionnaire [29], which was developed to quantify the amount of physical activity based on energy expenditure [30]. The questionnaire was translated, adapted, and validated in Brazil [31]. The instrument evaluates the levels of physical activity in three dimensions: occupational physical activity (OPA), in sports/exercise in leisure time (SEL), and in other leisure activities and/or commuting (LAC). Results are expressed in scores. The Metabolic Equivalent (MET) according to the intensity of the activity (standardised by the Compendium of Physical Activities [30]) was assessed in minutes per week (METmin). The intensity considered as moderate was ≥ 4 METs/week.

Socioeconomic, demographic and occupational information: Socioeconomic and demographic information were: per capita family income – total family income divided by the number of family members living on that income) and categorised in Brazilian minimum wages ('Up to 2', 'From 2 to 5', 'From 5 to 10', 'From 10 to 20'), marital status (single, divorced, married, widow), schooling level ('up to 9 years', 'More than 9 years'), and ethnicity (white, brown, black, Asian, indigenous). Occupational information was categorised by military rank ('Senior officers': captain, major, lieutenant-colonel, colonel and general; 'Officers': lieutenants; 'Sergeant-Majors and Sergeants'; and 'Corporals and Privates').

Other health risk factors: Other health risk factors were: current smoking and consumption of any amount of alcohol (in the last two weeks) and sleep disturbances (having trouble sleeping at bedtime and/or waking at night and having difficulty returning to sleep).

Statistical analysis

Exploratory and descriptive analyses were performed. To identify a cut-off point of METmin per week in relation to hypertension, analysis with quintiles was performed. For the bivariate analysis, the χ^2 test and simple Poisson regression (generalised linear models) were used. For variables that presented association with the outcome, a multivariate model was delineated to adjust for age, using the multiple Poisson regression to obtain more robust confidence intervals (CI), and the prevalence ratios (PR) were estimated.

For all analyses, the level of confidence was 95%. Data were entered using MS Access 2000, and statistical analyses were performed using the R Platform [32].

RESULTS

This was a census type study. The eligible number of integrants of the directorate for the study was 654. Sixty-eight had been deployed away from the directorate indefinitely, and per the exclusion criterion, they were excluded. Thirty-four were women, and because of the small number, they were withdrawn from the study. This methodology was applied in other related studies [21, 22]. From the 552 eligible individuals remaining, 46 refused to take part in the study. Thus, the study population was comprised of 506 servicemen in the Brazilian Army, which represents a participation rate of 92%. The mean age was of 29 years (±9.77), individuals with more than nine years of school totalled 94.7% (Table 1).

Table 1. Prevalence of hypertension according to sociodemographic characteristics and the health status

Characteristics		N	Hypertension		P
			Cases	%	
Ethnic					0.163
	White	232	19	(8.2)	
	Brown	174	24	(13.8)	
	Black	80	6	(7.5)	
	Asian	2	0	-	
	Indigenous	18	0	-	
Conjugal state					<0.001
	Single	252	13	(5.2)	
	Divorced	39	5	(12.8)	
	Married	212	29	(13.7)	
	Widowed	3	2	(66.7)	
Education					0.939
	More than 9 years	479	47	(9.8)	
	Up to 9 yeas	27	2	(7.4)	
Income[a]					0.658
	Up to 2	149	16	(10.7)	
	From 2 to 5	177	19	(10.7)	
	From 5 to 10	119	8	(6.7)	
	Above 10	41	4	(9.8)	
	Non-informed	20			
Rank					**<0.001**
	Senior officers[b]	65	13	(20.0)	
	Officers[c]	143	8	(5.6)	
	Sergeant-majors and sergeants	107	18	(16.8)	
	Corporals and privates	191	10	(5.2)	
Smoking[d]					0.818
	No	454	43	(9.5)	
	Yes	52	6	(11.5)	
Alcohol consumption[e]					0.135
	No	183	23	(12.6)	
	Yes	323	26	(8.0)	
Elevated cholesterol					**<0.001**
	No	469	37	(7.9)	
	Yes	37	12	(32.4)	

Characteristics		N	Hypertension		P
			Cases	%	
Sleep disturbances		c			0.818
	No	454	43	(9.5)	
	Yes	52	6	(11.5)	
Psychological distress					0.135
	No	183	23	(12.6)	
	Yes	323	26	(8.0)	

[a] Income calculated on minimum wages per capita family; [b] Senior Officers: major, lieutenant colonel, colonel and general; [c] Officers: lieutenant and captain; [d] Smoking: current smoking; [e] Alcohol consumption: any amount over the past two weeks. P (p-value) results from χ^2.

Prevalence of hypertension was 9.7%. Age was associated with the outcome. Simple Poisson regression revealed that the age categories 'From 36 to 45 years' ($p < 0.001$) and 'Above 45 years' ($p \leq 0.0001$) were associated with a higher prevalence of hypertension. Prevalence of hypertension according to age categories in the study population and in the Brazilian population [4] can be observed in Figure 1. All categories, except for the age category 'From 26 and 35 years', showed prevalence approximated to that in the general population, although it was slightly higher. Military personnel in the category 'Above 45 years' (41.4%) exhibited the greatest discrepancy compared with the national data, which was 34.2% in the male population [4].

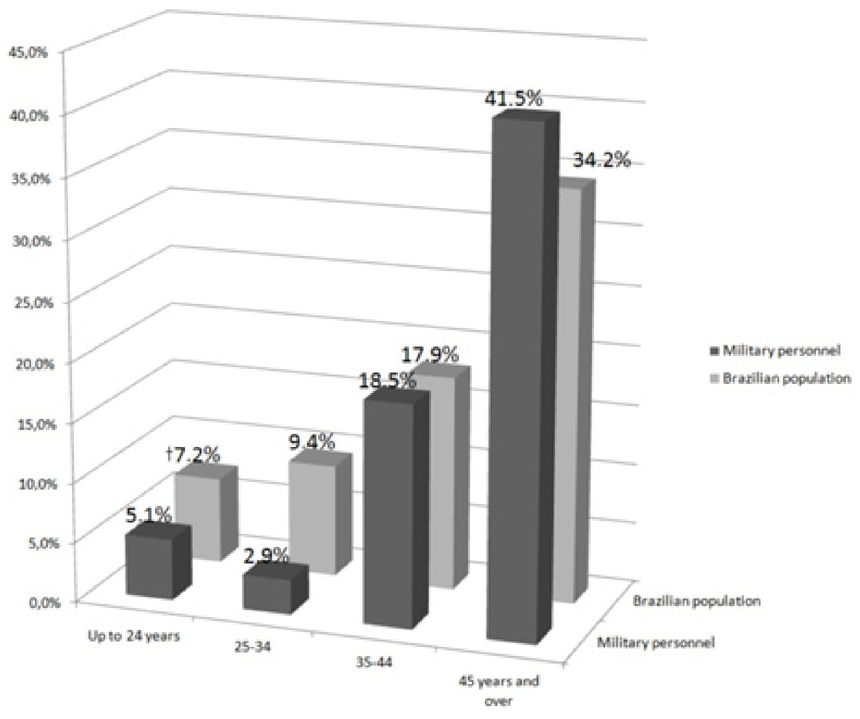

Fig. 1. Prevalence of self-reported hypertension among military personnel of the Army and in Brazilian population

Ethnicity, education, income, smoking, alcohol consumption, sleep disturbances, and physical activity dimension PALL were not associated with hypertension. Prevalence of psychological distress was 33% (Table 1) and was not associated with hypertension ($p = 1.00$) nor job stress (Table 2). Marital status, rank, and elevated cholesterol showed association with the outcome ($p < 0.05$) (Table 1).

Factors significantly associated with the outcome were conjugal status, rank, and elevated cholesterol.

Regarding the levels of PA by distinct dimensions (Table 2), OPA and SEL were inversely associated with hypertension ($p < 0.05$). Prevalence of elevated cholesterol was 7.3%, and among hypertensive the comorbidity with elevated cholesterol was 32.4%.

Table 2. Job stress and physical activity according to hypertension

Characteristics	Non-hypertensive			Hypertensive			P
	Mean	Median	SD[a]	Mean	Median	SD[a]	
Job stress	15.89	15.87	2.75	15.84	18.87	2.70	0.909
Physical activity[b]							
OPA[c]	3.17	3.13	0.53	2.93	2.88	0.45	**0.004**
SEL[d]	3.70	3.75	0.69	3.40	3.50	0.71	**0.006**
PALL[e]	2.88	3.00	0.65	2.88	3.00	0.58	0.985
METmin/week[f]	2.293	2.280	1.139	1.905	1.890	1.186	**0.034**

[a] SD: Standard deviation; [b] Physical activity by dimensions; [c] OPA: occupational physical activity; [d] SEL: physical activity in sports/exercise in leisure time; [e] PALL: other physical activities in leisure time/locomotion; [f] Energy expenditure in METs (metabolic equivalent) according to minutes of physical activity in SEL per week; P (p-value) results from the simple Poisson regression.

Table 3 presents the non-adjusted and adjusted PR for age. The age categories associated with hypertension were 'From 36 to 45 years' (PR = 3.63; 95%CI, 1.76–7.49) and 'Above 45 years' (PR = 8.13; 95%CI, 3.59-18.41), compared with 'Up to 25 years' (reference category). Marital status, military rank, and OPA, which initially were associated with hypertension, lost their significance after adjusting for age. Elevated cholesterol remained associated with hypertension and PR was 3.35 (95%CI 1.75-6.44). After adjustments, SEL showed inverse association with hypertension (PR = 0.64; 95%CI, 0.44-0.99) (Table 3).

Table 3. Prevalence ratios (PR) non-adjusted and adjusted of hypertension according to demographic characteristics

Characteristics	Non-Adjusted		Adjusted	
	PR	(CI95%)	PR	(CI95%)
Age				
Up to 25 years[b]	-	-	-	-
From 26 a 35 years	0.56	(0.18-1.78)		
From 36 a 45 years	**3.63**	**(1.76-7.49)**		
Above 45 years	**8.13**	**(3.59-18.41)**		
Conjugal state				
Single[b]	-	-	-	-
Divorced	2.49	(0.89-6.97)	1.14	(0.34-3.81)
Married	**2.65**	**(1.38-5.10)**	1.11	(0.43-2.85)
Widowed	**12.92**	**(2.92-57.27)**	2.76	(0.49-15,60)
Rank				
Corporals and privates[b]	-	-	-	-
Sergeant-majors and sergeants	**3.21**	**(1.48-6.96)**	1.16	(0.30-4.44)
Officers	1.07	(0.42-2.71)	0.93	(0.25-3.55)
Senior officers	**3.82**	**(1.68-8.71)**	0.83	(0.20-3.47)

Characteristics	Non-Adjusted		Adjusted	
	PR	(CI95%)	PR	(CI95%)
Elevated cholesterol	**4.11**	**(2.14-7.88)**	**3.35**	**(1.75-6.44)**
Physical activity				
OPA[b]	**0.43**	**(0.25-0.77)**	0.96	(0.49-1.91)
SEL[c]	**0.59**	**(0.40-0.86)**	**0.64**	**(0.44-0.95)**
1200 METmin/week[c]	**0.50**	**(0.28-0.91)**	**0.46**	**(0.25-0.83)**

[a] Adjusted for age; [b] Reference category; [c] 1200 METmin/week: cut-off point identified by quintiles analysis as the minimum amount for the weekly energy expenditure related to lower prevalence of hypertension.

The analysis by quintiles revealed a cut-off point for the lowest level of PA that presented association with lower prevalence of hypertension, which was 1,200 METmin/week, with the intensity of the activity ≥ 4 METs (p = 0.011). Most individuals (80.4%, n = 407) achieved this cut-off point, which was found to be a protective factor for hypertension (PR = 0.46; 95%CI, 0.25–0.83), but 19.6% (n = 99) presented PA levels below that level. Figure 2 exhibits the distribution of PA levels by METmin/week according to hypertension.

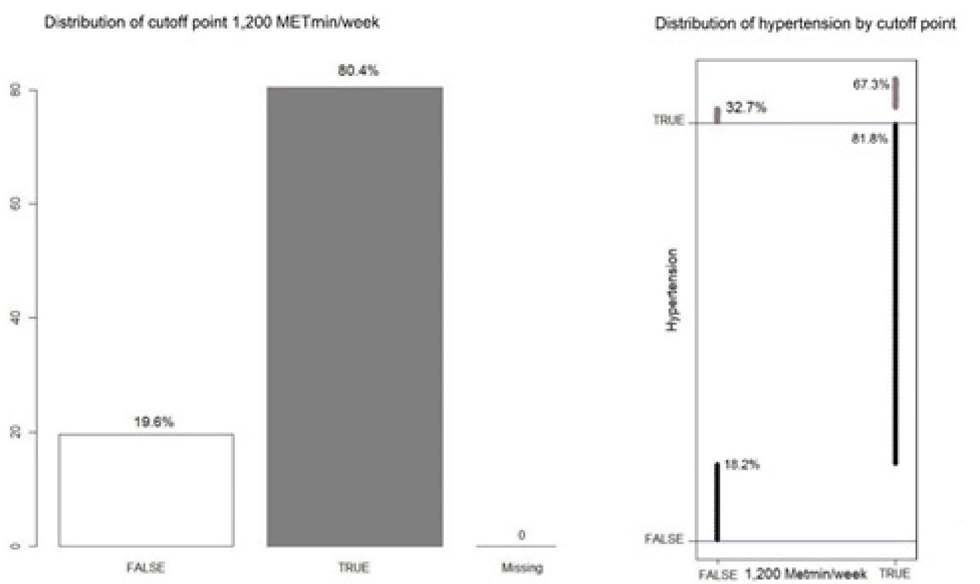

Fig. 2. Hypertension according to METs/week

DISCUSSION

The main findings were that physical activity in sports/exercise during leisure time and elevated cholesterol were associated with hypertension, regardless of age. Furthermore, in military personnel the expected association of job stress and psychological distress was not found. Nevertheless, the comorbidity of hypertension and elevated cholesterol was high.

Regarding the PA levels, the cut-off point for a weekly energy expenditure associated with lower prevalence of hypertension was identified. The cut-off point was 1,200 METs/week, which means approximately 50 minutes of physical activities with moderate intensity (≥ 4 METs) four times a week. This cut-off point was related to lower prevalence of hypertension among those in the higher age categories (‘From 36 to 45’ and ‘Above 45’) showing to be a protective factor (PR = 0.46; 95%CI, 0.25–0.83). In regard of the relationship between physical activity and hypertension, the literature shows that aerobic exercise in sessions of 40 minutes of moderate- to high-intensity in 3 to 5 times per week, involving a minimum of 800 METminutes per week, present effects on reducing blood pressure. Our results pointed in same direction. As the analyses were performed on dimensions of physical activity (OPA, SEL and PALL), types of exercises or sports (SEL) were analysed together. That can explain the difference to the minimum related to lower prevalence of hypertension (1,200 METmin/week) in the study population, according to the energy expenditure per week. This was an important finding because military personnel typically practice weekly physical training including aerobic, resistance and sports physical activities. Therefore, it is important to highlight the minimum amount desirable for their weekly energy expenditure that favours their cardiovascular health, which was presented here.

In relation to the physical activities dimensions, higher levels of SEL were associated with lower prevalence of hypertension even after controlling for age (PR=0.64, 95%CI, 0.44-0.95). This effect was not observed in dimensions OPA and PALL. Whereas PALL did not show association with the outcome, OPA initially presented an inverse association with hypertension; however, the statistical significance disappeared after adjusting for age. This finding can be explained by the occupational characteristics of the military environment: ranks of lieutenant, corporal and soldier have higher levels of OPA than other categories [22] and age is closely related to rank.

There is a plethora of literature regarding the health benefits of physical activity. However, the role of the different dimensions (sports/exercise, occupational, household, and other unstructured physical activities) is still not entirely clear. Physical activity is defined as “any bodily movement produced by the contraction of skeletal muscles that increases energy expenditure above a basal level” [33, 34] and is expressed in several different ways.

In the present study, SEL was the only dimension that was associated with hypertension independent of age and was related to lower rates of hypertension. These findings are consistent with the literature: leisure-time physical activity was previously found to reduce the probability of hypertension in men in Brazilian population (N = 54,353) [35]. This can be explained by the association of SEL with cardiorespiratory fitness [36] and decrease in SEL is causally associated with the incidence of hypertension [37]. The regular practice of physical activity promotes vascular remodelling, improving tissue perfusion, and decreasing peripheral vascular resistance, thus explaining the relationship between physical activity, hypertension, and other cardiovascular diseases [13, 15, 38, 39].

Focusing on military personnel of the Brazilian Army, they are expected to be physically active [22] and the results of the present study showed that regardless of hypertension individuals were still physically active. As presented in Table 2, hypertensives presented similar levels of SEL (mean of 3.40) compared to non-hypertensives (mean of 3.70). According to a longitudinal study (N = 54,998) conducted in the U.S. (NHANES III) with a follow-up period of more than eight years, physical activity was found significant independently of the pharmacologic treatment for blood pressure control. Physically inactive adults with treated and controlled hypertension had a higher risk of all-cause mortality (hazard ratio: HR = 1.42) compared with physically active adults (with treated and controlled hypertension). Moreover, normotensive adults who were physically active had a lower risk of mortality (HR = 0.72) compared with hypertensive adults who were active and had treated and controlled hypertension [40]. Another longitudinal study demonstrated that among hypertensive, walking and running produce similar reductions in all-cause mortality [41]. Our results indicate that hypertensives in the Brazilian army have reduced risk of all-cause mortality due to their physical active status.

Elevated cholesterol was strongly associated with hypertension, and after adjusting for age, the PR was 3.35 (95%CI, 1.75-6.44). Although due to the cross-sectional nature of the present study causality cannot to be evaluated, in scientific knowledge dyslipidaemias are one of the main risk factors to cardiovascular diseases [19] and are strongly associated with hypertension [5]. Therefore, our findings are in line with the literature.

The prevalence of comorbidity of elevated cholesterol among hypertensives was high (32.4%). As this comorbidity increases the risk for other cardiovascular diseases [18,19], this is an important finding and indicates the need for more attention to the cardiovascular risks among Brazilian military personnel.

The prevalence of elevated cholesterol (7.3%) was far lower than the 26.1% observed among males in Salvador, Bahia (BA), in a study with laboratory examinations (N = 7,392) [42] and was above the 3.5% (N = 1,039) prevalence found in Campos dos Goytacazes, Rio de Janeiro (RJ), where there were no significant differences between the sexes [43]. The large difference between data from BA and RJ may be related to regional eating habits. In this context, members of the Brazilian Army also come from different regions and probably have eating habits that reflect their regional origin. The lack of studies on this subject is evident.

The prevalence of hypertension according to age categories was in general slightly higher than in the general population (self-reported national survey) [4] (Figure 1). This can be partially explained by the self-reported assessment method: when a stratus seeks medical care more frequently (prevention programs), individuals have a greater chance of being diagnosed by a physician. In low- and middle-income countries, it is common to observe weak health systems, which occurs in Brazil; and this can lead to large numbers of individuals without a diagnosis and/or treatment [1]. Differently, Brazilian military personnel have their health constantly monitored, and thus, self-reported prevalence can be higher than in the general population. However, the category 'Above 45 years' (41%) exhibited the greatest discrepancy compared with the national data (34% of the male population) [4]. This indicates that more attention must to be paid to this group.

Although socioeconomic and demographic factors can be related to hypertension [5,35], this was not observed in our study. This result can be explained by the standardisation of such aspects in the study population in terms of income, age, sex and education involved in the selection process to enter the Army, thus leading to homogeneity that eliminated those socioeconomic and demographic effects. Ethnicity was not associated with hypertension, which is in agreement with data of Brazilian urban population sample [44].

There was no association of job stress or psychological distress with hypertension. Even though these psychosocial variables were not associated with hypertension, another study indicated that both are associated with lower levels of SEL [22]. The literature shows that mental disorders are causally associated with the development of hypertension [45,46]; however, in the present study, this association was not observed. Hence, it is recommended that further longitudinal studies should be conducted to identify etiological factors of hypertension prevalence among servicemen in the Brazilian Army.

Although literature indicates that smoking and alcohol consumption are associated with hypertension [5], this was not observed in our study. This can be explained by the amount of these practices among the participants. It is plausible that as the majority of participants were physically active, the amount of the consumption of these substances might be reduced as health behaviours are usually related to each other [47]. However, further studies should examine the moderator effect of physical activity on the consumption of alcohol and cigars.

STRONG POINTS AND LIMITATIONS OF THE STUDY

The strengths of this study include that, to our knowledge, this was the first study to estimate the prevalence of hypertension among the military personnel in the Brazilian Army with a sample that was representative of the entire contingent covering all military ranks, which means participants from all different age and income categories, and with different occupational characteristics. Moreover, the study design was census type and the participation rate of 92% was very good.

Another strong point was the use of Baecke's Questionnaire [29]. This is one of the main questionnaires widely used in epidemiological research on physical activity and provides a more detailed examination identifying and distinguishing the levels of practice in three different dimensions: occupational (OPA), sports/exercise (SEL), and other activities in leisure and locomotion (PALL). The instrument was developed based on the energy expenditure measure using patterns standardised established by the Compendium of Physical Activities [30], which contributes to comparability among studies.

The present study added contribution to the little-explored area of PA by dimensions and addressing a need identified in the literature [35]. Nevertheless, the association of PA according to domains shows different influences on mental health [48], therefore it is relevant to investigate the issue. Additionally, this study evaluated the relationship between job stress and psychological distress with hypertension in military personnel, further aggregating knowledge on this subject.

One possible limitation of this study is that self-reported prevalence can be over- or under-estimated depending on the number of medical consultations of the participants; however, this methodology has been widely used and presents validity for epidemiological studies [49]. This method is especially important for low- and middle-income countries because of its feasibility and low costs. The withdrawal of women from the analyses took place because the number represented very few individuals and as could weaken the overall results. This methodology was previously applied in this context [21]. Additionally, there is the limitation of the cross-sectional design that does not allow determining the temporal nature of the factors under study; therefore, the causal direction of the association is restricted.

The methodology to estimate prevalence through self-reported data has been widely used in literature, principally in low- and middle-income countries. In multidimensional studies it is common that direct measurements, such as blood pressure, are not always viable. In this context, literature shows that self-reported estimative of diseases are usually used as approximation of the prevalence, in this case, for hypertension [23, 35].

CONCLUSIONS

This study evaluated the association of PA levels, job stress, psychological distress, elevated cholesterol and sociodemographic factors with hypertension in military personnel of the Brazilian Army. Expected associations of job stress and psychological distress with hypertension were not exhibited in the participants, which can possibly be related to the status of being physically active. The prevalence of comorbidity of elevated cholesterol and hypertension was high, which aligns to the general population data.

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