

Relationship between workers' lifestyles and high blood pressure unawareness

Relação entre estilo de vida dos trabalhadores e desconhecimento da pressão arterial elevada

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Abstract

Background: Lack of awareness of hypertension is a major deterrent to the prevention of complications arising from this condition. **Objective:** This study aimed to identify the lifestyle characteristics associated with a higher prevalence of high blood pressure (HBP) unawareness in a population of workers. **Method:** A sample of 339 hypertensive workers or having HBP was used. Unawareness of HBP was defined as: systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg and/or using antihypertensive drugs and without a previous diagnosis of hypertension. The main explanatory variables under consideration were physical activity, body mass index, and unhealthy eating habits. Poisson regression with robust variance was used in the adjusted models. **Results:** The prevalence of HBP unawareness was 63.4% (95% confidence interval — 95%CI 58.1–68.4), and it was higher among workers with three or more unhealthy eating habits (prevalence ratio — PR 1.30) and physically active workers (PR 1.21). HBP unawareness was less common among overweight and obese individuals (PR 0.81). Unhealthy habits and behaviors can contribute to a higher prevalence of HBP in workers. **Conclusion:** Awareness programs should be undertaken at the workplace to facilitate a healthier environment that allows improved management of the disease, with the potential to reduce the economic burden on the health care system.

Keywords: hypertension; knowledge; worker; epidemiological studies; prevalence.

Resumo

Introdução: O desconhecimento da pressão arterial elevada é um grande impedimento para a prevenção de complicações decorrentes dessa condição. **Objetivo:** Este estudo objetivou identificar características do estilo de vida associadas a maior prevalência de desconhecimento da pressão arterial elevada em trabalhadores. **Método:** Foi utilizada uma amostra de 339 trabalhadores hipertensos ou com pressão arterial elevada. Desconhecimento da pressão arterial elevada: pressão arterial sistólica ≥ 140 mmHg e/ou pressão arterial diastólica ≥ 90 mmHg e/ou em uso de anti-hipertensivos e sem diagnóstico prévio de hipertensão arterial. Variáveis explicativas: atividade física, índice de massa corporal e hábitos alimentares não saudáveis. Regressão de Poisson com variância robusta foi utilizada nos modelos ajustados. **Resultados:** A prevalência de desconhecimento da pressão arterial elevada foi de 63,4% (intervalo de confiança de 95% — IC95% 58,1–68,4), maior entre trabalhadores com três ou mais hábitos alimentares não saudáveis (razão de prevalência — RP 1,30; IC95% 1,07–1,58) e fisicamente ativos (RP 1,21; IC95% 1,02–1,42). O desfecho foi menos comum



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entre indivíduos com sobrepeso e obesos (RP 0,81; IC95% 0,70–0,94). **Conclusão:** Programas de conscientização devem ser realizados no local de trabalho para facilitar um ambiente de trabalho mais saudável que permita melhor manejo da doença, com potencial para reduzir a carga econômica no sistema de saúde.

Palavras-chave: hipertensão; conhecimento; trabalhador; estudos epidemiológicos; prevalência.

INTRODUCTION

The work environment plays a fundamental role in defining workers' health and living conditions¹. The physical demands on the body and the impact on cognitive and psychological abilities in the workplace can manifest as work-related illnesses, which often present as non-communicable diseases such as hypertension². Work-related diseases and injuries were responsible for the deaths of 1.9 million people in 2016, according to the first joint estimates from the World Health Organization (WHO) and International Labour Organization³. Hypertension, an important non-communicable disease, may significantly reduce work productivity and family income. Hypertension also contributes to the burgeoning costs of the healthcare system and the resultant losses, particularly when it is not diagnosed early⁴.

Hypertension and low levels of blood pressure (BP) control among workers is associated with major cardiovascular events such as stroke⁵. Among asymptomatic patients, the prevalence of high blood pressure unawareness is high⁶, which is a major public health issue. Considering the potential influence of high blood pressure on productivity at work, there is a need to promote the reduction of risky behaviors among workers⁷. However, in Brazil, the prevalence of high blood pressure unawareness was 59.1% among maritime transport employees⁸. In India, this percentage was 60% among police officers and in Asia⁹, 77% of hypertensive workers were unaware of having the disease¹⁰. Awareness of one's hypertensive status can promote self-care and consequently reduce complications associated with the disease¹¹.

Contextual, socioeconomic, and lifestyle characteristics have been identified as possible factors associated with high blood pressure unawareness, and these factors function as barriers to the effective treatment of the disease^{6,12}. Inappropriate lifestyle choices are associated with a higher prevalence of cardiovascular diseases among workers, because individuals may be exposed to unhealthy habits such as consumption of tobacco, alcohol, and physical inactivity¹³. Some modifiable risk factors can also coexist, increasing the risk of developing non-communicable diseases and the consequent mortality from these conditions¹⁴. Adherence to healthy behaviors is a known form of non-pharmacological treatment; however, individuals who are unaware of their high blood pressure status tend not to follow these guidelines^{4,15}. In addition, the limited access to health services for formal and informal workers in Brazil makes these professionals more susceptible to underdiagnosis of chronic diseases¹⁶.

Therefore, this study aimed to estimate the prevalence of high blood pressure unawareness in a population of workers in a municipality in northeastern Brazil and to determine possible associations with lifestyle variables.

METHODS

This cross-sectional epidemiological study used data from the HealthRise longitudinal project in Vitória da Conquista, a city located in the northeastern region of Brazil^{17,18}. The research was conducted involving a population of workers served by the Social Service of Industry (SESI), a private, non-profit entity with a mission to qualify the workforce and promote worker health¹⁹. Data were collected between August 2017 and July 2018.

The study included workers aged ≥ 18 years who were residing in the city and came to SESI for routine periodic consultations with the occupational physician. The exclusion criterion was workers from other cities. In total, 2024 workers fulfilled the inclusion criteria and constituted the study sample. For the sample calculation, a 95% confidence level was used with a 50% prevalence (due to the multiple outcomes measured in the main project) and a tolerable error of 2%. The final sample after considering a loss of 10% was 1,218 workers.

A total of 1,275 workers were interviewed, of which 339 were classified as hypertensive, and these workers comprised the study population. The original design of the study was not formulated for the purpose of investigating the prevalence of high blood pressure unawareness, therefore the power of the sample was calculated considering a significance level of 5%, accuracy of 10%, and high blood pressure unawareness prevalence of 63.4%. The study sample showed 98.0% power.

Data collection

Individual interviews were conducted by properly trained interviewers using tablets containing the KoboToolbox software, (<https://www.kobotoolbox.org/>). The interview instrument used was a semi-structured questionnaire based on the questionnaire of the Brazilian National Health Survey²⁰ and the short version of the International Physical Activity Questionnaire (IPAQ)²¹.

Three blood pressure measurements were taken using the Omron digital sphygmomanometer model HEM-7113 with an interval of one minute between each measurement²². The measurements were carried out after the interviews, to ensure that the individuals were at rest, sitting with their legs uncrossed, their feet resting on the floor, their backs reclining on the chair and relaxed, their left arm resting on the table at the level of the heart. It was assured that they did not have a full bladder, had not exercised for at least 60 minutes, had not consumed alcohol, coffee, or food, and had not smoked in the last 30 minutes. The final value of blood pressure was obtained by the mean of the last two measurements²³. Participants stood barefoot, wearing light clothing on a properly calibrated digital portable electronic scale (SECA 813) for weight measurement. Height was measured with a portable NutriVida stadiometer with the participants standing barefoot in an upright position.

Variables studied

The dependent variable of the study was high blood pressure unawareness, which was defined as hypertensive patients being unaware of their status and not using antihypertensive drugs, but having systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. The following lifestyle-related variables were considered to be the main explanatory factors: physical activity (PA) level, body mass index (BMI), and coexistence of unhealthy eating habits. Unhealthy eating habits included inadequate consumption of fruits and salads with raw vegetables; consumption of soft drinks; consumption of red meat without removing fats; and replacement of main meals with ultra-processed foods.

PA was assessed using the short version of the IPAQ²⁴, and was measured by multiplying the weekly frequency (days) of moderate and vigorous PA by the average duration (min) of such activities. The time spent on vigorous activities was multiplied by two. Only activities performed for at least 10 min continuously were validated. Participants who performed < 150 min of PA per week were considered inactive^{3,24}.

BMI was calculated by dividing weight (kg) by the square of height (m^2), with values < 18.5 kg/m^2 indicating thin or underweight, those between 18.5 and 24.9 kg/m^2 indicating eutrophy, with values between 25 and 29.9 kg/m^2 indicating overweight, and values > 30 kg/m^2 indicating obesity²⁵. This variable was divided into underweight/eutrophy and overweight/obesity.

For the food-related variables, the weekly frequency of consumption of fruits and salads with raw vegetables was considered and categorized as ≥ 5 days a week (adequate) or < 5 days a week (inadequate)²⁶. For the consumption of soft drinks, intake ≥ 5 days a week was considered excessive and < 5 days a week was considered adequate. For consumption of red meat, consumption after "removing the excess apparent fat" was defined as adequate and "eating with the fat" was defined as inadequate²⁶. The habit of replacing the main meals (lunch or dinner) with sandwiches, snacks, or pizzas at least one day of the week was classified as inadequate and those who reported not replacing meals were classified as adequate²⁶.

To evaluate the coexistence of unhealthy eating habits, the presence of the five variables (consumption of raw fruits and salads with vegetables, soft drinks, and red meat and

replacement of main meals with ultra-processed foods) was evaluated, with the appropriate items coded as “0” and inappropriate items coded as “1.” The individual scores could range from none to the coexistence of five unhealthy eating habits. These scores were divided into three categories: the presence of up to one unhealthy habit; coexistence of two unhealthy habits; coexistence of three or more unhealthy habits²⁷.

The covariables used as adjustment factors were gender, age in years (18–29 years, 30–39 years, and ≥40 years), education (0–8 years, 9–11 years, and ≥12 years), work shift (day/night and daytime only), occupation, medical appointment in the last 12 months, and self-rated health^{6,7,8,11}.

The position held was classified according to the occupation categories of the Brazilian Classification of Occupations — CBO²⁸. This variable was categorized as manual (workers in industries in general, civil construction, general services, and single manual services) or non-manual (administrative workers, workers in health and education)²⁹.

To determine the use of health services, the following question was asked: “When did you last see a doctor?”, and the responses were categorized as “in the last 12 months” or “12 months or more”³⁰. Self-rated health was determined using the question: “In general, how do you evaluate your health?”³¹, which was divided into positive (very good, good) and negative (regular, bad, and very bad)¹².

Statistical analysis

Descriptive analysis was performed using values of absolute and relative frequency. The prevalence of high blood pressure unawareness among hypertensive workers was estimated with a 95%CI. Bivariate and multivariate analyses were performed with estimations of the PRs and calculation of the respective p-values and confidence intervals using Poisson regression with robust variance.

The possible associations between the main explanatory variables and high blood pressure unawareness were measured by different adjusted models. Initially, the association between high blood pressure unawareness and the main explanatory variables was evaluated with adjustments using the main explanatory variables (model 1). In the second model, the associations between the main variables and high blood pressure unawareness were further adjusted by sociodemographic variables (gender, age, education, work shift, and occupation). In the third model, the variables of medical appointment in the last year and self-rated health were added as adjustment factors to the previous model. The association was considered statistically significant at a $p \leq 0.05$. The Akaike criterion (AIC)³² was used to compare the models. The Stata program (version 14) was used to analyze the data.

This research was approved by the Research Ethics Committee of the Multidisciplinary Health Institute (IMS) of the Federal University of Bahia (UFBA) (Opinion number: 1,861,073) and the participants provided written informed consent, in accordance with that described in Resolution 466/2012.

RESULTS

Of the 1,275 workers participating in the main study, 339 were classified as high blood pressure. Of these, 63.4% (95%CI 58.1–68.4) were unaware of their high blood pressure status. Among those aware of their diagnosis with hypertension, 80.6% were being treated and, of those being treated, 62.0% had their blood pressure under control (Figure 1).

The characteristics of the studied hypertensive population (Table 1) included a higher percentage of male participants (86.4%), those aged ≥40 years (45.1%), those with 9–11 years of formal education (49.9%), individuals living with a partner (69.3%), workers on day shifts (79.5%), and manual workers (59.3%). Most participants evaluated their health as positive (53%) and stated that they had seen a doctor in the last year (63.3%). With regard to the lifestyle factors, most hypertensive workers were overweight or obese (67.6%), had three or more unhealthy eating habits (43.2%), and were classified as physically active (58%).

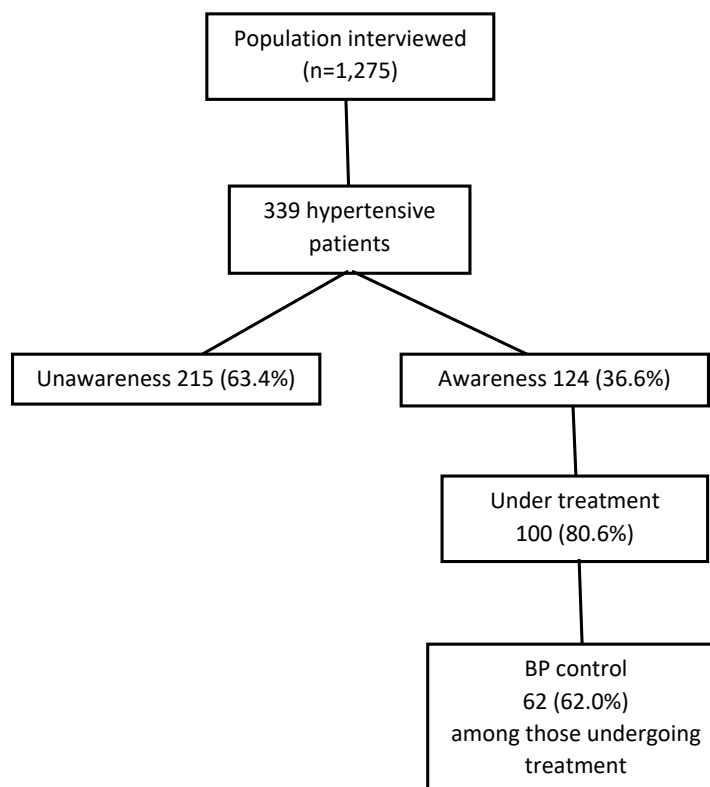


Figure 1. Prevalence, unawareness, treatment, and control of hypertension in a population of hypertensive workers from Vitória da Conquista (BA), a city in northeastern Brazil for the period Aug 2017 to Jul 2018.

In the bivariate analysis (Figure 2), the prevalence of high blood pressure unawareness was lower among overweight and obese patients (56.8%) than among eutrophic or underweight participants (78.0%). Participants with ≥ 3 unhealthy eating habits exhibited a higher prevalence of high blood pressure unawareness (77.1%) than those without unhealthy habits or had one (53.6%) or two (55.0%) unhealthy habits. Those classified as physically active exhibited a higher prevalence of high blood pressure unawareness (68.4%) than those considered as physically inactive (57.0%).

The adjustment covariates used in this study were sociodemographic (gender, age, education, shift and position held) and self-assessment of health and medical consultation in the last 12 months. The prevalence of unawareness of high blood pressure was higher among men, among individuals aged between 18 and 29 years and among those with complete high school and technical education. Those who rated their health as positive and reported not having seen a doctor in the last 12 years also had a higher prevalence of high blood pressure. The shift and position held were not statistically significant with the outcome (Table 2).

In the first multivariate analysis model, the main explanatory variables were adjusted among themselves. Workers who reported having ≥ 3 unhealthy eating habits and those classified as physically active exhibited a positive association with high blood pressure unawareness. Overweight and obese individuals showed a lower prevalence of high blood pressure unawareness. The directions of the associations observed in model 1 were maintained in models 2 (adjusted for sociodemographic variables) and 3 (adjusted for sociodemographic variables, self-rated health, and medical appointment in the last year) (Table 3).

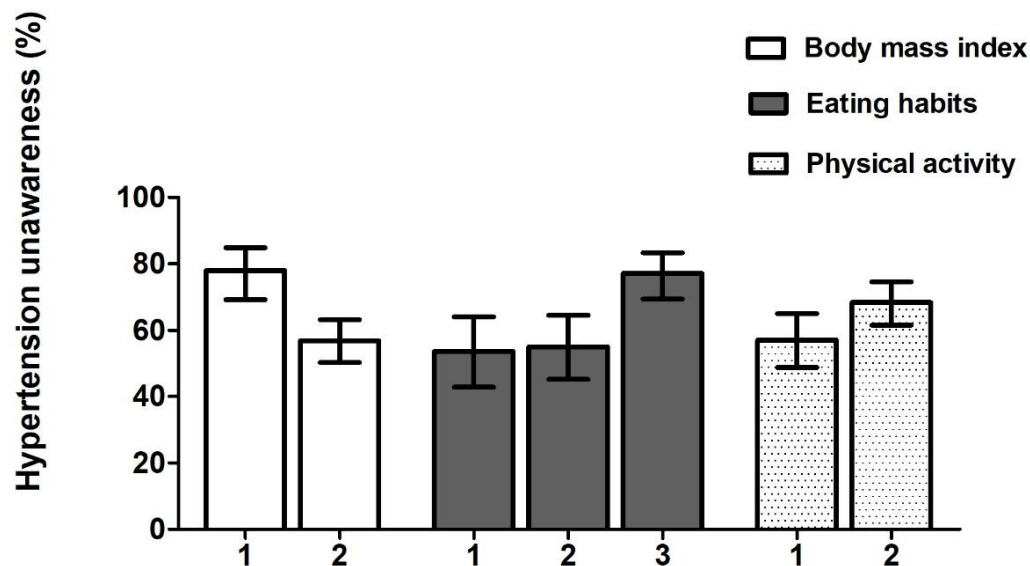
DISCUSSION

In this study, the prevalence of high blood pressure unawareness was considered to be high, and lifestyle variables were associated with high blood pressure unawareness. Workers classified as physically active and those who had ≥ 3 unhealthy eating habits displayed a higher

Table 1. Characteristics of the population of hypertensive workers (n=339).

Variable	n	%	95%CI
Sex			
Female	46	13.6	10.3–17.7
Male	293	86.4	82.3–89.7
Age (years)			
18–29	69	20.4	16.4–25.0
30–39	117	34.5	29.6–39.8
40 or older	153	45.1	39.9–50.5
Schooling (years of study)			
0–8	95	28.2	23.6–33.3
9–11	168	49.9	44.5–55.2
≥12	74	21.9	17.8–26.7
Marital status			
No partner	104	30.7	25.9–35.8
Living with a partner	235	69.3	64.2–74.0
Work shift			
Day/night	68	20.5	16.5–25.2
Daytime	264	79.5	74.8–83.5
Position held			
Not manual	138	40.7	35.6–46.1
Manual	201	59.3	53.9–64.4
Alcohol abuse			
Yes	166	48.9	43.6–54.3
No	173	51.1	45.7–56.3
Smoking			
Yes	41	12.1	9–16
No	298	87.9	84–91
Self-rated health			
Negative	159	47.0	41.7–52.4
Positive	179	53.0	47.6–58.3
Medical appointment in the last year			
Yes	212	63.3	57.9–68.3
No	123	36.7	31.7–42.0
Body mass index			
Underweight/eutrophy	109	32.4	27.6–37.6
Overweight/obesity	227	67.6	62.3–72.4
Coexistence of unhealthy eating habits			
0–1 habit	84	25.9	21.4–31.0
2 habits	100	30.9	26.0–36.1
3 or more habits	140	43.2	37.9–48.7
Physical activity			
Inactive	142	42.0	36.8–47.4
Active	196	58.0	52.6–63.2

n: absolute number (may vary in relation to losses and non-responders); 95%CI: 95% confidence interval.



Body mass index ($p < 0.001$): 1=underweight/eutrophy; 2=overweight/obesity. Coexistence of unhealthy eating habits ($p < 0.001$): 1=no habits or one unhealthy eating habit; 2=coexistence of two unhealthy eating habits; 3=coexistence of three unhealthy eating habits. Physical activity ($p = 0.033$): 1=inactive; 2=active.

Figure 2. Prevalence of unawareness of high blood pressure in a population of workers according to lifestyle variables. Vitória da Conquista (BA), 2017–2018.

prevalence of high blood pressure unawareness, whereas being overweight or obese was negatively associated with high blood pressure unawareness²⁹.

Previous studies reported that the prevalence of high blood pressure unawareness was 56.8% in Brazil⁶, 46.0% in India³³, and 57.1% in China³⁴. Within the specific population of workers, the percentages are higher than those observed in the general population. In another Brazilian study that included maritime transport workers ($n = 316$), the prevalence of high blood pressure unawareness was 59.1%⁸, whereas a study of workers in India ($n = 384$) reported a prevalence of 56.9%³⁵. Although the prevalences observed in these studies were high, they were still lower than that observed in the present study. This could be attributed to the differences in specific conditions encountered by each population. In northeast Brazil, which is an underserved area, individuals may have greater health vulnerability due to fewer opportunities for diagnosis owing to limited access to healthcare services.

The economically active population often consists of a larger proportion of younger and unmarried individuals, and this group is more likely to be unaware of the presence of high blood pressure^{36,37}. In addition, among workers, the average number of hours worked and work shift (mostly daytime) can limit the access to health services.

An inadequate lifestyle is associated with low work capacity and high prevalence of non-communicable diseases³⁷. Adherence to healthy habits and behaviors can reduce the prevalence of hypertension and, consequently, the risk of complications⁸. Workers' awareness of the disease and its risk factors are fundamental for adoption of healthy eating habits^{37,38}. In this study, workers with ≥ 3 unhealthy eating habits had a higher prevalence of high blood pressure unawareness. The energy intake among Brazilian workers has increased in recent decades, resulting in more overweight and obese individuals, and, consequently, a higher prevalence of high blood pressure³⁹. An unhealthy diet directly affects all-cause mortality, and many deaths are attributable to simultaneous unhealthy eating habits⁴⁰.

Unhealthy foods generally cost less and can be quickly prepared and consumed, in addition to being easily accessible outside the home. Thus, the simultaneity of unhealthy habits observed in this population of hypertensive workers may be partly due to conditions in the work environment and the ease of access and consumption of unhealthy foods⁴¹. The occupational environment is closely related to eating habits, since some meals are consumed during working hours. The work environment should, therefore, be a setting for the development and

Table 2. Prevalence ratio of unawareness of high blood pressure in a population of workers according to sociodemographic and health variables. Vitória da Conquista (BA), 2017–2018.

Variables	RP	95%CI
Sex		
Female	1.00	
Male	2.09	1.37–3.20
Age (years)		
40 or older	1.00	
18–29	1.82	1.52–2.20
30–39	1.41	1.15–1.73
Schooling (years of study)		
0–8	1.00	
9–11	1.25	1.01–1.52
≥12	1.00	0.76–1.30
Work shift		
Daytime	1.00	
Day/Night	0.99	0.81–1.21
Position held		
Not manual	1.00	
Manual	1.05	0.89–1.24
Self-rated health		
Negative	1.00	
Positive	1.27	1.10–1.50
Medical appointment in the last year		
Yes	1.00	
No	1.22	1.04–1.43

RP: Prevalence ratio; 95%CI: 95% confidence interval.

Bold indicates statistically significant p-values.

implementation of health promotion programs that encourage the consumption of healthy meals and identify risk factors for chronic diseases^{41,42}.

Physically active workers showed a higher prevalence of high blood pressure unawareness than physically inactive workers, and this association was maintained in the different models evaluated. The majority of the surveyed population comprised male workers, and the level of both PA and high blood pressure unawareness have been demonstrated to be higher in men than women^{4,7,10}. Additionally, people who are not aware of their high blood pressure status are younger and are more likely to be more physically active⁴. Individuals who are aware of their hypertension status usually assess their health as fair or poor and mostly feel unable to perform PA⁴⁰.

In addition, the prevalence of high blood pressure unawareness among physically active participants was significantly higher in the underweight/eutrophic group compared to that in the overweight/obesity group (81.9 vs. 62.7%, $p < 0.01$, data not shown in the results). High blood pressure can be mitigated by regular PA, leading to reduced need for diagnosis and health services⁴². The new WHO “2020 Guidelines on Physical Activity and Sedentary Behavior” reinforce the value of PAs of any duration in the control of blood pressure levels, starting from

Table 3. Multivariate analysis between lifestyle variables and unawareness of high blood pressure in a population of workers. Vitória da Conquista (BA), 2017–2018.

Variables	Model 1			Model 2			Model 3		
	RP	95%CI	p-value	RP	95%CI	p-value	RP	95%CI	p-value
Coexistence of unhealthy eating habits									
0–1	1.00			1.00			1.00		
2	1.06	0.82–1.37	0.645	1.04	0.82–1.32	0.761	1.02	0.80–1.30	0.873
3 or more	1.42	1.15–1.76	0.001	1.31	1.07–1.60	0.008	1.30	1.07–1.58	0.009
Physical activity									
Inactive	1.00			1.00			1.00		
Active	1.22	1.03–1.45	0.019	1.20	1.02–1.41	0.030	1.21	1.02–1.42	0.026
Body mass index									
Underweight/ eutrophy	1.00			1.00			1.00		
Overweight/ obesity	0.74	0.64–0.86	<0.001	0.81	0.70–0.94	0.005	0.81	0.70–0.94	0.005
Akaike criterion	592.2504	580.9772	573.1947						

RP: Prevalence ratio; 95%CI: 95% confidence interval. $p \leq 0.05$.

Model 1: adjusted using the variables physical activity, coexistence of eating habits, and body mass index.

Model 2: adjusted using the variables physical activity, coexistence of eating habits, body mass index, gender, age, education, work shift and position held.

Model 3: adjusted using the variables physical activity, coexistence of eating habits, body mass index, gender, age, education, work shift and position held, medical appointment in the last year, and self-rated health.

those with light intensity⁴³. Therefore, promoting interventions that encourage a reduction in sedentary lifestyles, such as encouraging light-intensity activities and small series of activities, such as walking or climbing stairs, both in working environments and in extra-working environments, can contribute to the enhancement of workers' health and reduction of long-term complications.

The presence of comorbid conditions such as obesity can affect high blood pressure levels^{39,41}, the appearance of signs and symptoms. Overweight or obesity showed a negative association with high blood pressure unawareness. In previous studies, overweight or obese individuals have demonstrated high levels of high blood pressure awareness and subsequently undergo treatment for the disease^{34–36}. Overweight individuals tend to show greater awareness of their high blood pressure status due to greater use of health services to modify their nutritional status¹¹. Conversely, low weight or eutrophy may lead individuals to avoid considering the possibility of high blood pressure, leading to a lower demand for health services⁴.

The study had limitations. The analyses were based on two blood pressure measurements collected at the same time. However, clinical diagnosis should be based on at least two measurements at different times⁴⁴. Nevertheless, epidemiological studies are important for the screening of hypertension, identification of asymptomatic individuals, and survey of indicators, and other population-based studies have been conducted using the same methodology used in the present study^{6,12}. The possibility of the occurrence of cases of individuals who used antihypertensive drugs, had their blood pressure levels controlled and did not know they were hypertensive was also considered. However, it was verified in the data and this situation did not occur in the present study. This study also used a robust sample with a small sampling error. All data were collected following previously established protocols and the researchers were adequately trained, reducing the possibility of data collection errors.

Our data provides useful information about high blood pressure unawareness in workers in Brazil. The findings suggest that those who were unaware of their hypertensive condition had an inappropriate lifestyle for non-pharmacological management of high blood pressure, such as an inadequate diet. This fact reinforces the need for adequate guidance for specific population groups, such as workers, in order to promote enhanced monitoring of the health/disease condition, thereby encouraging prevention, diagnosis, and control of chronic diseases and reducing the vulnerability of this social group.

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DATA AVAILABILITY STATEMENT

The datasets generated and/or analyzed during the study are available from the corresponding author upon request.

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