

Prevalence of hypertension and associated factors in adults and older residents of Teresina, Piauí: a hierarchical analysis

Prevalência de hipertensão arterial e fatores associados em adultos e idosos residentes em Teresina, Piauí: uma análise hierarquizada

Prevalencia de hipertensión arterial y factores asociados en adultos y ancianos residentes en Teresina, Piauí: un análisis jerárquico

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Abstract

Introduction: Hypertension (HT) is a public health problem with high prevalence worldwide. Countless factors, such as age, sex, race/color, education, income, access to health services and lifestyle habits, are described as influencing the prevalence of HT, most of which are considered modifiable and controllable by the adoption of a healthy lifestyle. **Objective:** To estimate the prevalence of HT and associated factors in adults and older people living in Teresina, Piauí. **Methods:** Population-based cross-sectional study with 898 adults and older individuals. Sampling was complex probabilistic by clusters. The outcome was the self-reported diagnosis of HT. A hierarchical analysis was performed in three blocks (sociodemographic characteristics, monitoring of health and lifestyle) with determination of the prevalence ratio (PR) and 95% confidence interval (95%CI) by Poisson multiple regression. **Results:** The overall prevalence of self-reported HT was 27.9% and increased with age. In the final model, the factors associated with self-reported HT were: age ≥ 60 years (PR=8.08; 95%CI 3.72–17.52), no education (PR=1.73; 95%CI 1.18–2.54), last blood pressure measurement <6 months prior (PR=2.64; 95%CI 1.56–4.47), regular salt intake (PR=0.70; 95%CI 0.52–0.93), altered waist circumference (PR=1.56; 95%CI 1.29–1.90) and altered blood pressure (PR=1.64; 95%CI 1.35–2.01). **Conclusions:** The prevalence of self-reported HT was higher, compared to different national and international studies carried out in recent years, with linear growth, associated with age group progression. The associated factors identified reflect the already known vulnerable groups for HT, and others may be the result of the growth in prevalence among other higher income social strata. In view of the high prevalence of HT in Teresina, its high burden of morbidity and mortality and being the main preventable cause of premature death, it is necessary to intensify measures to promote health, prevent the disease and monitor the treatment of HT in the municipality.

Keywords: Hypertension; Prevalence; Risk factors; Epidemiological surveys; Population studies in public health.

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Resumo

Introdução: A hipertensão arterial sistêmica (HAS) é um problema de saúde pública, com elevada prevalência em âmbito mundial. Inúmeros fatores, tais como idade, sexo, raça/cor, escolaridade, renda, acesso aos serviços de saúde e hábitos de vida são descritos como influenciadores da prevalência da HAS. A maioria deles é considerada modificável e controlável pela adoção de um estilo de vida saudável. **Objetivo:** Estimar a prevalência de HAS e fatores associados em adultos e idosos residentes em Teresina, Piauí. **Métodos:** Estudo transversal, de base populacional, com 898 adultos e idosos. A amostragem foi probabilística complexa por conglomerados. O desfecho foi o diagnóstico autorreferido de HAS. Realizou-se análise hierarquizada em três blocos (características sociodemográficas, acompanhamento da saúde e estilo de vida) com cálculo de razão de prevalência (RP) e intervalos de confiança de 95% (IC95%) por regressão múltipla de Poisson. **Resultados:** A prevalência geral da HAS autorreferida foi de 27,9% e aumentou com a progressão da faixa etária. No modelo final, os fatores associados à HAS autorreferida foram: idade ≥ 60 anos (RP=8,08; IC95% 3,72–17,52), sem escolaridade (RP=1,73; IC95% 1,18–2,54), última aferição da PA < 6 meses (RP=2,64; IC95% 1,56–4,47), consumo regular de sal (RP=0,70; IC95% 0,52–0,93), circunferência da cintura alterada (RP=1,56; IC95% 1,29–1,90) e pressão arterial alterada (RP=1,64; IC95% 1,35–2,01). **Conclusões:** A prevalência da HAS autorreferida foi mais alta comparada com diferentes estudos nacionais e internacionais realizados nos últimos anos, com crescimento linear associado à progressão da faixa etária. Os fatores associados identificados refletem os grupos vulneráveis para HAS já conhecidos e outros podem ser resultados do crescimento da prevalência entre outras camadas sociais de maior renda. Diante da elevada prevalência da HAS em Teresina, da sua alta carga de morbimortalidade e de ser a principal causa evitável de morte prematura, torna-se necessário a intensificação das ações de promoção de saúde, prevenção do agravo e monitoramento do tratamento da HAS no município.

Palavras-chave: Hipertensão; Prevalência; Fatores de risco; Inquéritos epidemiológicos; Estudos populacionais em saúde pública.

Resumen

Introducción: La hipertensión arterial sistémica (HAS) es un problema de salud pública con alta prevalencia a nivel mundial. Innumerables factores, como la edad, el sexo, la raza/color, la educación, la renta, el acceso a los servicios de salud y los hábitos de vida, se describen como influyentes en la prevalencia de la HAS, la mayoría de los cuales se consideran modificables y controlables mediante la adopción de un estilo de vida saludable. **Objetivo:** Estimar la prevalencia de hipertensión arterial sistémica (HAS) y factores asociados en adultos y ancianos residentes en Teresina, Piauí. **Métodos:** Estudio transversal de base poblacional con 898 adultos y ancianos. El muestreo fue complejo probabilístico por conglomerados. El resultado fue el diagnóstico autoinformado de HAS. Se realizó un análisis jerárquico en tres bloques (características sociodemográficas, seguimiento de la salud y estilo de vida) con cálculo de la Razón de Prevalencia (RP) e intervalos de confianza del 95% (IC95%) por regresión múltiple de Poisson. **Resultados:** La prevalencia general de HAS autoinformada fue del 27,9% y aumentó con la progresión de la edad. En el modelo final, los factores asociados a la HAS autoinformada fueron: edad ≥ 60 años (RP=8,08; IC95% 3,72–17,52), sin escolaridad (RP=1,73; IC95% 1,18–2,54), última Medición de PA < 6 meses (RP=2,64; IC95% 1,56–4,47), ingesta regular de sal (RP=0,70; IC95% 0,52–0,93), Circunferencia de Cintura alterada (RP=1,56; IC95% 1,29–1,90) y Presión Arterial Alterada (RP=1,64; IC95% 1,35–2,01). **Conclusiones:** La prevalencia de HAS autorreferida fue mayor, en comparación con diferentes estudios nacionales e internacionales realizados en los últimos años, con crecimiento lineal, asociado a la progresión por grupos de edad. Los factores asociados identificados reflejan los grupos vulnerables ya conocidos para la HAS y otros pueden ser el resultado del crecimiento de la prevalencia entre otros estratos sociales de mayores ingresos. Ante la alta prevalencia de HAS en Teresina, su alta morbilidad y mortalidad y ser la principal causa evitable de muerte prematura, es necesario intensificar las acciones de promoción de la salud, prevención del agravamiento y seguimiento del tratamiento de la HAS en el municipio.

Palabras clave: Hipertensión; Predominio; Factores de riesgo; Encuestas epidemiológicas; Estudios de población en salud pública.

INTRODUCTION

Hypertension (HT) is one of the most common chronic morbidities in the world, being found in approximately 22.3% of the world population aged ≥ 18 years.¹ The prevalence of HT shows inequalities between countries, being around 10% higher in low-income countries.² In Brazil, HT affects 32.5% of the adult population (36 million individuals), with different distribution between the regions of the country, with emphasis on the North and Northeast regions, which have lower prevalence of HT compared to other regions.³

Despite the lower prevalence of HT in the Northeast region, hospitalization and mortality rates resulting from HT are high, with high costs for the health system. In this region, the state of Piauí gains notoriety for having the highest average number of deaths associated with HT compared to other Brazilian states,⁴ which may be associated with the treatment and control conditions for HT, as well as quality and living conditions. of the Piauí population living with HT.

In Teresina, two studies address the prevalence and factors associated with HT in specific groups and populations, such as older people linked to a specific health institution and workers in a certain sector, not reflecting the reality of HT in the adult and older population.^{5,6} The population-based studies that address the adult population of Teresina deals only with the prevalence of HT.^{7,8} Therefore, to date, there has been no population-based study on the prevalence and factors associated with HT in adult and older people living in Teresina, which becomes a differentiator of this study. Given the above, our study aimed to determine the prevalence of HT and associated factors in adults and older residents of Teresina, Piauí, Brazil.

METHODS

We conducted a population-based survey type cross-sectional study. It was a part of the research “Home Health Survey — ISAD”, developed by the Interdisciplinary Doctorate (DINTER) at the Federal University of Piauí (UFPI), in partnership with the University of São Paulo (USP). The study was carried out in the urban areas of the city of Teresina, capital of Piauí.

The sample size considered the stratification of the population by age and sex. Knowing that Teresina had 210,093 households,⁹ the average number of individuals in each age group per household was calculated. The 3–4 female age group (n=578 households) was the largest sample size in terms of number of households.

Based on the identified household number (578), the expected number of individuals for each age group and sex was obtained. Next, a simulation study was carried out with regard to the 95% confidence interval (95%CI) and the coefficient of variation of the standard error of the proportion — CV(p) for estimates of the proportion (p) ranging from 10 to 70%, according to age group, sex and respective sample size.

Keeping in mind losses (refusals, absences, errors in responses, etc.), the final sample size was adjusted using $n=n_0/0.80$, assuming a response rate of 80%, resulting in $n\cong 750$ households.

The sampling plan was carried out using a cluster sampling process, in two stages: census tracts and households. To improve sampling efficiency, census sectors were, when necessary, divided or grouped so that the coefficient of variation of their dimensions did not exceed 10%. Thus, the Primary Sampling Units (PSU) generated could consist of a single census sector, a fraction or a group of census sectors.

The PSU were ordered according to their code, so that all areas of the urban area were represented in the sample. Thus, a systematic sample was taken from this ordered list of PSU, with probability proportional to size.

Subsequently, systematic sampling of households was carried out within each PSU selected in the first stage, when all residents in the selected households were included in the study. The overall sampling fraction used was: $f = \frac{aM_i}{\sum M_i} \times \frac{b}{M_i}$, where: f=global sampling fraction; a=total number of PSU to be selected in the first stage; M_i =number of households in PSU “i”; b=number of households to be drawn in each selected PSU.

The second-stage sampling fraction was fixed, making the number of households drawn greater (or smaller) than planned, if the census sector had grown (or decreased) since the 2010 Census.⁹ With this option, the fraction of second stage sampling could be rewritten as: $\frac{b(M_i/M_i')}{M_i'}$, where M_i' is the number of households in sector “i” obtained in the household listing activity, carried out in the field.

For the city of Teresina, 30 PSU were defined, selected with equiprobability; all residents of each selected household were included in the study.

In Teresina, the final sample was made up of 1,125 individuals (children, adolescents, adults and older people). For this study, the final sample consisted of 898 individuals (680 adults and 218 older people) of both sexes who agreed to participate in the study.

The outcome (self-reported HT) was obtained by the question: “Has a doctor ever diagnosed you with high blood pressure?”

Data collection took place between October 2018 and December 2019, using questionnaires adapted from the “ISA 2008: Health Surveys in the city of São Paulo” and the National Health Survey (PNS), carried out in 2013, using the Epicollect 5® software (Imperial College London).

Statistical analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS), version 20.0. For the variables that had missing data, it was decided to perform the imputation using the predictive mean matching method, and the percentage of imputed data did not exceed 20%.¹⁰

Absolute and relative frequencies were determined using descriptive statistics. To test the association between the variables, bivariate analysis was performed using Pearson’s χ^2 and Fisher’s exact tests. The variables that showed $p \leq 0.20$ in the bivariate analysis were inserted into the multivariate model, with a hierarchical technique, according to the organization of the variables, demonstrated in Figure 1.

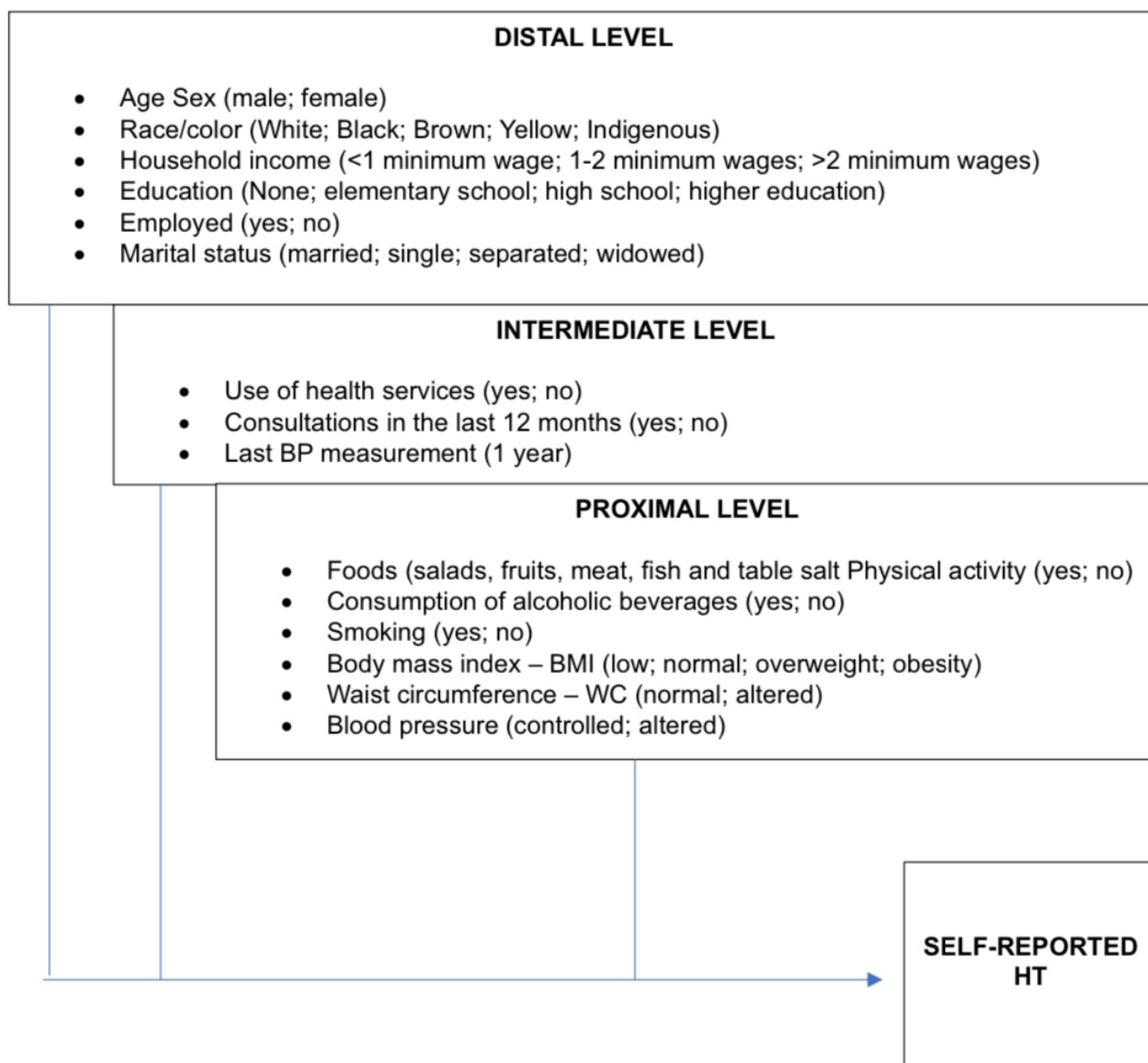


Figure 1. Organizational chart of variables and entry into the hierarchical analysis.

Poisson multiple regression analysis was performed according to the structured hierarchical model. The entry of variables into the hierarchical model followed the distal-proximal direction and used the backward stepwise elimination method. *A priori*, only variables at the distal level were tested, remaining those with $p \leq 0.20$ (model 1). Then, the variables at the intermediate level, which showed $p \leq 0.20$, after adjustment for the variables from model 1, remained in model 2. The same procedure was carried out with the variables at the proximal level, after adjustment for the variables from model 2. Finally, the variables that showed $p \leq 0.05$ were inserted into the final model (model 3). To determine the strength of association between the variables, the prevalence ratio (PR) and respective 95%CI were calculated. The significance level used was 5%.

The ISAD project followed ethical principles in compliance with Resolution 466/12, being authorized by the Municipal Health Foundation (FMS) of Teresina and approved by the Research Ethics Committee of the Federal University of Piauí (UFPI), under Approval No. 2.552.426.

RESULTS

Characterization of sample

To estimate the prevalence of HT and associated factors in adults and older people in Teresina/PI, 898 individuals were interviewed, 680 adults and 218 older individuals. The overall prevalence of self-reported HT was 27.9% (95%CI 25.0–30.9). When stratified by age group, the prevalence increased with the progression of the age group. It reached 3.8% (95%CI 2.6–5.1) of the population aged 20 to 29 years and 59.7% (95%CI 56.4–62.9) among the population aged 60 and over. The highest prevalences were identified in females (29.2% — 95%CI 26.2–32.2), individuals of black race/color (33.8% — 95%CI 30.7–36.9), those with household income >2 minimum wages (29.3% — (95%CI 23.2–32.3), people with no education (77.5% — 95%CI 74.8–80.2), those unemployed (34.4% — 95%CI 31.3–37.5) and widowed individuals (69.1% — 95%CI 66.1–72.1) (Table 1).

The results obtained in the bivariate analysis of the association between the outcome and sociodemographic characteristics showed a higher PR for self-reported HT in individuals aged ≥ 60 years (PR=15.51; 95%CI 7.44–32.3), with no education (PR =5.27; 95%CI 3.64–7.63), unemployed (PR=1.47; 95%CI 1.19–1.82) and widowed (PR=5.40; 95%CI 7.44– 32.3). The variable related to race/color ($p=0.129$) was not statistically significant in the bivariate analysis. However, it was included in the multivariate analysis as it allowed $p \leq 0.20$ (Table 1).

The bivariate analysis of characteristics related to access to health services showed a significant association between self-reported HT and individuals who reported using health services (PR=1.61; 95%CI 1.20–2.15), having consultations in the last 12 months (PR=2.15; 95%CI 1.37–3.38) and with blood pressure (BP) measurement less than six months ago (PR=4.65; 95%CI 2.61–8.28), as described in Table 2.

In the results of the bivariate analysis between the outcome and the food consumption and lifestyle variables, the PR for HT was higher in individuals who reported, according to their perception, low/very low salt intake (RP=1.52 ; 95%CI 1.11–2.10), did not perform regular physical activity (RP=2.31; 95%CI 1.59–3.35), reported not consuming alcoholic beverages (RP=1.53; 95%CI 1 .21–1.92), had some degree of obesity (PR=2.46; 95%CI 1.86–3.26), had altered WC (PR=2.57; 95%CI 2.07–3.17) and altered BP

Table 1. Bivariate analysis between self-reported hypertension and the sociodemographic characteristics of adults and older people living in Teresina, 2019.

	Total n (%)	Prevalence of HT n (%)	RP	IC95%	p-value ^a
Age range (years)					
20 to 29	182 (20.3)	7 (3.8)	1	-	
30 to 39	185 (20.6)	25 (13.5)	3.51	1.56–7.92	
40 to 49	152 (16.9)	34 (22.4)	5.82	5.65–12.74	<0.001
50 to 59	146 (16.3)	46 (31.5)	8.19	3.81–17.60	
≥60	233 (25.9)	139 (59.7)	15.51	7.44–32.32	
Sex					
Male	333 (37.1)	86 (25.8)	1	-	0.276
Female	565 (62.9)	165 (29.2)	1.13	0.90–1.41	
Race/color					
White	102 (12.2)	31 (30.4)	1	-	
Black	157 (18.7)	53 (33.8)	1.11	0.77–1.60	
Yellow	53 (6.3)	9 (17.0)	0.56	0.29–1.09	0.129
Brown	526 (62.8)	149 (28.3)	0.93	0.67–1.29	
Indigenous	2 (0.0)	-		-	
Household income (minimum wage)					
<1	157 (18.1)	41 (26.1)	1	-	
1 to 2	504 (58.2)	141 (28.0)	1.07	0.79–1.44	0.803
>2	205 (23.7)	60 (29.3)	1.12	0.80–1.57	
Education					
No schooling	40 (4.6)	31 (77.5)	5.27	3.64–7.63	
Elementary school	270 (31.0)	108 (40.0)	2.72	1.89–3.90	
High school	357 (41.0)	81 (22.7)	1.54	1.05–2.26	<0.001
Higher education	204 (23.4)	30 (14.7)	1	-	
Employed					
No	421 (48.2)	145 (34.4)	1.47	1.19–1.82	
Yes	452 (51.8)	106 (23.5)	1	-	<0.001
Marital status					
Single	250 (28.7)	32 (12.8)	1	-	
Married	490 (56.2)	149 (30.4)	2.37	1.67–3.37	
Separated	64 (7.3)	23 (35.9)	2.81	1.77–4.45	<0.001
Widowed	68 (7.2)	47 (69.1)	5.40	3.77–7.74	
Total		251 (27.9)			

Source: Home Health Survey (ISAD).

NS/NR not included in the analysis; ^aPearson χ^2 test; PR: prevalence ratio; 95%CI: 95% confidence interval; MW: minimum wage; HT: hypertension.

(PR=2.05; 95%CI 1.64–2.57). The chance of the outcome was 31% lower among those who did not smoke (0.58; 95%CI 0.55–0.85) (Table 3).

Multivariate analysis, using a hierarchical technique, indicated the following factors associated with self-reported HT in the final regression model: age ≥60 years (PR=8.08; 95%CI 3.72–17.52), no education

Table 2. Bivariate analysis between hypertension and the characteristics of access to health services for adults and elderly people living in Teresina, 2019.

	Total n (%)	Prevalence of HT n (%)	RP	95%CI	p-value ^a
Use of health services					
No	213 (24.4)	42 (19.7)	1	-	<0.001
Yes	660 (75.6)	209 (31.7)	1.61	1.20–2.15	
Consultations in last 12 months					
No	118 (13.5)	17 (14.4)	1	-	<0.001
Yes	755 (86.5)	234 (31.0)	2.15	1.37–3.38	
BP measurement					
<6 months	615 (71.5)	223 (36.3)	4.65	2.61–8.28	<0.001
≥6 months and ≤1 year	104 (12.1)	17 (16.3)	2.09	1.02–4.28	
>1 year	141 (16.4)	11 (7.8)	1	-	

Source: Home Health Survey (ISAD).

NS/NR not included in the analysis; ^aPearson χ^2 test; PR: prevalence ratio; 95%CI: 95% confidence interval; MW: minimum wage; HT: hypertension.

(PR=1.73; 95%CI 1.18–2.54), last BP measurement <6 months prior (PR=2.64; 95%CI 1.56–4.47), regular salt consumption (PR=0.70; 95%CI 0.52–0.93), altered WC (PR=1.56; 95%CI 1.29–1.90) and altered BP (RP=1.64; 95%CI 1.35–2.01) (Table 4).

DISCUSSION

The present study is the first to determine the prevalence of self-reported HT and associated factors in Teresina/PI, with a hierarchical approach to variables, on the basis of a population-based survey designed to analyze the health conditions of the population of Teresina/PI. Self-reported HT is considered a very useful method in epidemiological and population studies as it is easy to apply and low cost, in addition to helping to develop public health measures aimed at preventing and treating HT.¹¹

The results revealed that more than a quarter of the Teresina population investigated reported a diagnosis of HT. The prevalence of self-reported HT was higher compared to the results of other population-based studies whose prevalence of self-reported HT ranged from 16.1 to 24.5% in the adult population.¹²⁻¹⁴

The differences observed in the prevalence of self-reported HT may be associated with the methodology used in different types of studies, which may have limited comparability due to local or regional coverage.¹³ Furthermore, the increase in the prevalence of self-reported HT in Teresina can be explained by the expansion of health actions that made it possible to establish the diagnosis of HT as a result of the improvement in primary health care (PHC) coverage in the municipality and population aging observed throughout the country, which contributes significantly to the increase in the occurrence of diseases chronic non-communicable diseases (NCDs), such as HT.¹⁴⁻¹⁶

On the basis of the various epidemiological studies on the prevalence of self-reported HT, we found that the highest prevalences are identified in population groups already known in the literature, such as older people, women, individuals of black race/color and those without education, without work or widowed, probably because they have poorer conditions of access to information and health services, impacting the population's health conditions and prevention, control and treatment of HT.^{14,17,18} These

Table 3. Bivariate analysis between hypertension and the characteristics of food consumption, alcohol consumption, smoking, physical activity and anthropometric and blood pressure measurements in adults and older people living in Teresina, 2019.

	Total n (%)	Prevalence of HT n(%)	PR	95%CI	p-value ^a
Raw salads					
≤4 days per week	446(62.4)	119(26.7)	0.98	0.76–1.24	0.809 ^a
>4 days per week	269(37.6)	74(25.5)	1	-	
Cooked vegetables and legumes					
≤4 days per week	522(86.0)	141(27.0)	0.74	0.54–1.01	0.073 ^a
>4 days per week	85(14.0)	31(36.5)	1	-	
Fruits					
≤4 days per week	341(43.0)	92(27.0)	1	-	0.410 ^a
>4 days per week	452(57.0)	134(29.6)	1.09	0.88–1.38	
Red meat					
≤4 days per week	610(78.6)	170(27.9)	1.29	0.94–1.76	0.110 ^a
>4 days per week	166(21.4)	36(21.7)	1	-	
Chicken					
≤4 days per week	631(76.3)	176(27.9)	0.88	0.69–1.12	0.312 ^a
>4 days per week	196(23.7)	62(31.6)	1	-	
Fish					
≤4 days per week	584(97.5)	171(29.3)	0.63	0.36–1.09	0.158 ^b
>4 days per week	15(2.5)	7(46.7)	1	-	
Salt consumption					
High/very high	122(14.0)	34(27.9)	1	-	<0.001 ^a
Regular	508(58.4)	114(22.4)	0.80	0.58–1.12	
Low/very low	240(27.6)	102(42.5)	1.52	1.11–2.10	
Regular physical activity					
No	709(79.0)	225(31.7)	2.31	1.56–3.35	<0.001 ^a
Yes	189(21.0)	26(13.8)	1	-	
Consumption of alcoholic beverages					
No	521(59.7)	174(33.4)	1.53	1.21–1.92	<0.001 ^a
Yes	352(40.3)	77(21.9)	1	-	
Currently smokes					
No	649(74.3)	167(25.7)	0.69	0.55–0.85	<0.001 ^a
Yes	224(25.7)	84(37.5)	1	-	
Body mass index (BMI)					
Low	30 (3.4)	5 (16.7)	0.92	0.40–2.12	<0.001 ^a
Normal	304(34.5)	55 (18.0)	1	-	
Overweight	328(37.2)	88(26.8)	1.48	1.10–2.00	
Obesity	220(24.9)	98(44.5)	2.46	1.86–3.26	
Waist circumference (WC)					
Normal	569(64.5)	102(17.9)	1	-	<0.001 ^a
Altered	313(35.5)	144(46.0)	2.57	2.07–3.17	
Blood pressure (BP)					
Normal	462(52.4)	86(18.6)	1	-	<0.001 ^a
Altered	412(47.6)	160(38.2)	2.05	1.64–2.57	

Source: Home Health Survey (ISAD).

NS/NR not included in the analysis; ^aPearson χ^2 test; PR: prevalence ratio; 95%CI: 95% confidence interval; MW: minimum wage; HT: hypertension.

Table 4. Multivariate analysis, using a hierarchical technique, of factors associated with self-reported hypertension in adults and older people living in Teresina, 2019.

	Model 1		Model 2		Model 3 (Final)	
	PR	95%CI	PR	95%CI	PR	95%CI
Age range (years)						
20 to 29	1		1		1	
30 to 39	3.36	1.49;7.59*	3.10	1.39;6.94*	2.74	1.24;6.05*
40 to 49	5.51	2.50;12.15*	4.41	2.16;10.38*	3.80	1.76;8.24*
50 to 59	7.56	3.49;16.41*	6.59	3.06;14.20*	5.22	2.42;11.23*
≥60	12.92	6.07;27.50*	10.21	4.79;21.76*	8.08	3.72;17.52*
Education						
No education	2.04	1.40;2.97*	1.89	1.29;2.77*	1.73	1.18;2.54*
Elementary school	1.42	0.99;2.01	1.31	0.92;1.85	1.19	0.85;1.66
High school	1.24	0.87;1.76	1.19	0.84;1.67	1.12	0.80;1.57
Higher education	1		1		1	
Use of services						
No			1		1	
Yes			1.29	0.98;1.69	1.29	1.00;1.67
Last BP measurement						
Less than 6 months ago			2.89	1.70;4.92*	2.64	1.56;4.47*
Between 6 months and 1 year ago			1.66	0.87;3.19	1.63	0.86;3.11
More than 1 year ago			1		1	
Salt consumption						
High/very high					1	
Regular					0.70	0.52;0.93*
Low/very low					0.82	0.60;1.10
Physical activity						
No					1.07	0.74;1.53
Yes					1	
Consumption of alcoholic beverages						
No					1	
Yes					1.10	0.90;1.35
Smokes or has smoked						
No					1	
Yes					1.07	0.88;1.31
Waist circumference						
Normal					1	
Altered					1,56	1,29;1,90*
BP						
Normal					1	
Altered					1,64	1,35;2,01*

Source: Home Health Survey (ISAD).

PR: prevalence ratio adjusted by variables from the same block and above; 95%CI: 95% confidence interval; BP: blood pressure;

*Significant result; Method: Backward Stepwise Elimination.

findings coincide, for the most part, with those presented in this study, corroborating the persistence of conditions associated with the outcome and that require greater attention to these factors, with a view to promoting health conditions conducive to the prevention of NCDs, especially HT.

Therefore, it is necessary to consider the persistence of inequalities across different Brazilian population groups to formulate strategies that take into account the most vulnerable population. It is noteworthy that tackling social inequalities in health is conditioned by public policies capable of modifying social determinants, improving the distribution of benefits or minimizing the effects of the unequal distribution of power and property in modern societies.¹⁹

Contrary to what is pointed out in the literature, the present study showed a higher prevalence of self-reported HT among individuals with higher family income.^{17,18} This finding is extremely significant when observed from the perspective that people with higher family income would have greater access to health services, both public and private, thus facilitating the diagnosis of pathologies such as HT. Other points can be highlighted in this scenario: the increase in NCDs in different social classes; carrying out this study in the urban areas of the capital of Piauí, which, theoretically, would have the highest incomes; and, finally, the reflection of income distribution policies.

One of the most relevant factors in the occurrence of NCDs is increasing age, which is associated with increased BP levels, resulting from vascular changes typical of the aging process, among other factors.^{13,20} Accordingly, the prevalence of HT reaches 3% among the adult population (18 to 59 years old) up to 74.6% of the population aged ≥ 60 years in Brazil.^{13,17,20} Population aging associated with changes in lifestyle impacts the population's quality of life in general and the increase in the burden of HT.²¹ According to Melo et al.,¹⁸ the health situation in Brazil is characterized by an accelerated demographic transition and an epidemiological profile of the triple burden of diseases, which mainly affects the most vulnerable layers, resulting in countless years of life lost due to disability, mainly in the Northeast and North regions.

Among women, although the PR was higher compared to men, this finding did not reach statistical significance. On the other hand, a higher prevalence of self-reported HT among women was identified. As an explanation, scientific evidence points to the probable influence of the use of contraceptives, polycystic ovary syndrome, pregnancy, hormone replacement and menopause, which contribute significantly to the increase in BP.^{13,18,22} Furthermore, it is known that women seek health services more frequently, which may determine the early diagnosis of HT in this group.

Scientific information.¹⁴ points to a higher prevalence of self-reported HT among widowed individuals, similar to the result revealed in this study. Although there are other factors that may increase the occurrence of HT among widowed individuals (increased age), this finding can be explained by the fact that the absence of marital companionship can interfere with the diagnosis and control of HT.¹⁴ To establish the more evident association between HT and widowhood, further investigations are necessary.

In addition to the factors that can be directly or indirectly associated with HT, others are also of epidemiological importance in the genesis of or association with the development of HT: sedentary lifestyle, drinking alcohol, smoking, and unhealthy diet, including excessive salt consumption, considered modifiable by adopting healthy habits.²³ In this sense, one of the important findings was the perception of the interviewee diagnosed with HT regarding low/very low or regular consumption of salt, which may reflect knowledge of the harm caused by excessive salt intake or the erroneous perception of its consumption, since other factors were identified (altered BP).

Although other factors influence BP control, such as adherence to treatment (medication and non-medication), excessive salt intake is often associated with ineffective HT control, reflected in high BP levels.

A study carried out in Teresina showed that 15.2% of the adult population reported high salt use, which is worrisome. On the other hand, restricting this consumption has been shown to reduce BP.^{1,24-26} Therefore, it is worth reinforcing the importance of being careful with the amount of salt added to food.^{25,26}

Often associated with greater cardiovascular risk and the development of HT is altered WC, which is directly related to overweight and obesity. Both WC and BP are factors that are not usually associated with the outcome (HT), in most studies, as they are not investigated.^{13,14,22}

It is known that WC is an indicator of abdominal fat concentration, whose changes beyond normal values increase the risk of developing HT by up to 474%.^{24,27} Research carried out on the association between general and abdominal obesity with HT pointed out that WC is a risk predictor for the development of HT, especially in older people.²⁶

Controlling BP involves pharmacological and lifestyle-related measures and also encouraging reducing salt consumption, quitting smoking and minimizing alcohol intake, as well as weight control and physical activity.^{1,24}

Among the main control measures for HT, we highlight BP monitoring, which can be done at home, but preferably in health services during follow-up. Therefore, the greater frequency of BP measurement identified in this study may be related to the frequent use of health services, primarily in PHC, which has great potential to reduce health risks and encourage the promotion of healthy behaviors.²⁴ The use of such services may occur because of the demand associated with the greater need of users to perform procedures, as well as the expansion of access and knowledge of the HT condition.²⁸

In health services developed by PHC, BP measurement must be carried out at each consultation/evaluation.²⁴ The significant association found in this study between altered BP and the outcome corroborates the study by Barroso et al.²⁴ A change in BP beyond normal reflects ineffective control of blood pressure, which requires recommendations and referral for follow-up.¹

As measures to promote health and prevent diseases, especially HT complications, the actions developed by PHC must address measures to encourage healthy practices, such as the cessation of smoking and use of alcoholic beverages, promotion of physical activity as measures of lifestyle change.^{1,15,24} In the present study, reporting not smoking was a protective factor for the outcome.

It is important to highlight that smoking is an independent risk factor for cardiovascular disease, with a direct association with increased cardiovascular risk due to the action of components present in cigarettes, which enhance the atherosclerotic process.¹⁴ Therefore, all forms of smoking are considered harmful.²⁹

As for the consumption of alcoholic beverages, their effect varies according to sex and the quantity and frequency of intake.^{1,7,24} According to Gouveia et al.,³⁰ the consumption of low or moderate doses of alcohol is associated with reduced mortality from all causes and cardiovascular disease (CVD); Abusive consumption (three to four doses per day) is one of the most common causes of reversible HT.³⁰ The finding of this study regarding the higher prevalence of self-reported HT in individuals who reported not consuming alcoholic beverages can be explained by the fact that individuals are known to be hypertensive and associate the consumption of any amount of alcohol with harm in controlling HT.

Physical activity and adequate nutrition are also associated with hypertension, as well as its control. The increase in the prevalence of overweight and obesity is a global pandemic, constituting a serious

public health problem,² which requires effective coping measures, especially in those individuals with HT. Altered anthropometric measurements, such as WC beyond normal, may be the result of the lack of regular physical activity, which is one of the most important factors for the primary prevention of HT and for improving the survival of people with HT.³¹ Its benefits extend beyond pathology, providing improvements in the quality of life of people with various chronic conditions.

The results presented in this study point to some associated factors already known in the literature and others that may demonstrate changes in disease behavior (HT) among social classes with higher income. Furthermore, they attest to the increase in the general prevalence of HT and other factors that are considered worrisome and demonstrate the behavior of the adult population regarding the lifestyle adopted, such as altered WC and BP in part of the Teresina population with self-reported HT. Such results are useful to support health measures within the scope of PHC, with the involvement of the population in the adoption of health promotion, disease prevention and monitoring of chronic diseases, such as HT.

Study limitations: selection bias may have occurred because of the fact that much information is self-reported. This can mainly impact the underestimation of the real prevalence and factors associated with HT in the city of Teresina, as self-reported information does not identify individuals who are unaware of the HT condition. Despite this, self-reported HT is considered a very useful, easy-to-use and low-cost method, being important for the development of measures aimed at preventing and treating HT.

To minimize the effects of information bias, especially linked to missing information and possible inadequate collection of information, as well as disagreement in the measurement of anthropometric measurements and BP measurement, data imputation was carried out using an appropriate method, in addition to training and standardization of the team to measure anthropometric and BP data, with verification of agreement between observers to assess the conformity of the measurements obtained.

Despite the limitations, the results presented reflect the health situation of the Teresina population regarding HT and can be used by health managers to establish public health measures aimed at combating the problem in the municipality and promoting health actions, as well as intensifying those actions already underway, in the context of PHC. Furthermore, the results presented can guide the practice of health professionals working in PHC in Teresina, directing measures developed based on the associated factors identified.

CONCLUSIONS

The prevalence of self-reported HT in Teresina/PI was high compared to several population-based studies carried out in recent years and showed linear growth associated with age progression.

The highest prevalences were identified in groups and conditions already known in the literature, which requires reorientation and/or intensification of actions already developed. Findings related to the higher prevalence among individuals with higher family income reflect the progression of HT among different social classes in Teresina.

The results presented may be useful to support the establishment of public health measures aimed at combating HT. To this end, more efforts must be directed by health managers and professionals in the municipality to face this problem that involves early diagnosis, continuous monitoring and prevention of complications and deaths, especially for this highest risk group identified in this study, for through health promotion, disease prevention and HT monitoring actions within the scope of PHC.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

EFPO: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. AQMN: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. MDMM: Supervision, Validation, Writing – original draft, Writing – review & editing. KMGF: Data curation, Resources, Project administration, Supervision, Validation. MTPR: Project Administration, Supervision, Validation, Writing – original draft, Writing – review & editing.

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