Functional performance indicators associated with hypertension in older people

Indicadores de desempenho funcional associados à hipertensão em pessoas idosas

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Abstract

Introduction: During aging, changes occur in the human body that increase the probability of arterial hypertension which can potentiate deleterious effects on functional performance. **Objective:** To analyze the association of functional performance indicators with hypertension in older people. **Methods:** An epidemiological, population-based, cross-sectional survey was conducted with 209 older adults (58.40% women). Functional performance was assessed by the following tests: handgrip strength; chair stand test; arm curl test; timed up and go (TUG); sit and reach test; and step in place test (SPT). Diagnosis of arterial hypertension was self-reported. **Results:** The prevalence of hypertension was found to be 58.90% (males: 51.70%; females: 63.90%). It was also observed that the hypertensive individuals of both sexes had worse performance in SPT and TUG ($p < 0.05$). Furthermore, it was found that each additional second for TUG increased by 11% the probability of hypertension in men (PR:1.11; 95%CI: 1.03-1.20) and by 7% in women (PR: 1.07; 95%CI: 1.04-1.12), while each step performed in the SPT decreased the probability for the outcome by 2% (men and women = PR: 0.98; 95%CI: 0.97-0.99). **Conclusion:** TUG was found to be positively associated with hypertension, while SPT was inversely associated with hypertension.

Keywords: Aging. Blood pressure. Epidemiology. Physical performance.

Resumo

Introdução: *Durante o envelhecimento ocorrem modificações no corpo humano, as quais aumentam a probabilidade de hipertensão arterial sistêmica (HAS), o que pode potencializar efeitos deletérios no desempenho funcional.* ***Objetivo:*** *Analisar a associação de indicadores de desempenho funcional com a HAS em pessoas idosas.* ***Métodos:*** *Inquérito epidemiológico, populacional, transversal, conduzido com 209 idosos (58,40% mulheres). O desempenho funcional foi averiguado pelos seguintes testes: força de preensão manual; levantar e sentar da cadeira; flexão do antebraço; levantar, caminhar e sentar (LCS); sentar e alcançar o pé; e marcha estacionária (ME). O diagnóstico da HAS foi autorreferido.* ***Resultados:*** *Averiguou-se a prevalência de HAS em 58,9% dos participantes (homens: 51,7%; mulheres: 63,9%). Observou-se, também, que os hipertensos de ambos os sexos apresentaram pior desempenho na ME e LCS (p < 0,05). Além disso, verificou-se que cada segundo a mais despendido para LSC aumentou em 11% e 7%, respectivamente, a probabilidade de HAS nos homens (RP: 1,11; IC95%: 1,03-1,20) e nas mulheres (RP: 1,07; IC95%: 1,04-1,12), enquanto cada passo a mais realizado na ME diminuiu em 2% a probabilidade para o desfecho (homens e mulheres = RP: 0,98; IC95%: 0,97-0,99).* ***Conclusão:*** *Identificou-se que o teste de LCS esteve positivamente associado à HAS. Ademais, a ME apresentou-se inversamente associada à HAS.*

Palavras-chave: *Envelhecimento. Pressão arterial. Epidemiologia. Desempenho físico.*

Introduction

Arterial hypertension is a chronic non-transmissible disease and is one of the most important risk factors for the onset of cardiovascular diseases. It has a multifactorial etiology which in turn is influenced by genetic/epigenetic, environmental, cultural, social and lifestyle factors, and it is characterized by high and sustained blood pressure levels.[1]

The frequency of this morbidity tends to increase with advancing age, which makes it more prevalent in older people. According to data from the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey, the age group between 55 and 64 years has a prevalence of hypertension of 49.40%, and in older adults 65 years or more, the prevalence is on the order of 61%.[2]

With regard to its evolution, it often presents as an asymptomatic condition and can lead to structural and/or functional changes in target organs, such as the heart, brain and kidneys.[1] Thus, regardless of its etiology, hypertension has the potential to culminate in complications, such as acute myocardial infarction, stroke, chronic kidney disease and a higher risk of mortality.[1] In addition, it is worth noting that the referred morbidity is a risk factor for cognitive decline, dementia and loss of functionality, especially in older people.[3]

In this context, it appears that, chronically, hypertension appears to have an adverse effect on functional performance, which can promote its decline with aging and negatively impact the functional independence of the older adults.[4] Therefore, it is plausible that hypertensive older people have a worse performance for physical fitness indicators, exemplified by balance, walking ability, muscle strength and aerobic capacity. However, after searching the literature, there was a lack of epidemiological research with such an investigation perspective.

In Brazil, only two studies were identified, albeit with small samples, one conducted only with older women[5] and the other without stratification by sex, with and without hypertension, considering the specificities of each sex.[6] Furthermore, it is essential to investigate the association of these indicators with the aforementioned outcome, aimed at gathering evidence that may enhance strategic actions, especially in primary health care, which provide the screening for older adults with greater probability of hypertension, which can minimize the occurrence of aggravating outcomes, through assertive interventions aimed at improving or maintaining functional performance in this population, considering the impact of said morbidity. Therefore, this study aimed to analyze the association of functional performance indicators with hypertension in older people.

Methods

This epidemiological investigation is a cross-sectional study, built from baseline data of the population survey "Health conditions and lifestyle of older people living in a small municipality: Aiquara cohort", which was conducted in February to April 2013 with all the older adults registered in the Family Health Strategy (ESF) of Aiquara, Bahia, Brazil.

Ethical aspects

This research was approved by the Research Ethics Committee of the State University of Southwest Bahia (UESB), under Approval No. 171.464/2012 and CAAE No. 10786212.30000.0055. All participants were informed about the objectives, procedures and voluntary character. Thus, after explanations about the study, they signed an informed consent form.

Eligibility criteria

For participation in the present study, the following inclusion criteria were adopted: age ≥ 60 years; not being institutionalized; and having a fixed residence in the urban area, sleeping four days or more at home. Those excluded had the following: cognitive impairment, verified by the reduced and validated version of the Mini Mental State Examination (MMSE),[7] with a cut-off point of < 13 points;[8] neurological disease or hearing problems that compromised the understanding of the questions; and a bedridden condition.

To this end, a census was initially carried out to identify all older adult's residents in the Aiquara headquarters, with the help of community health agents working in the ESF, which covers 100% of the municipality's population. Thus, all households in the urban area were visited and 232 older people met the established criteria.[9] Among these, for the present study, 23 were excluded for not having performed even one of the functional performance tests.

Collection of data

Data collection took place in two stages: 1) an interview carried out at the participants' home, conducted by a biologist, two master's students (one linked to the Graduate Program in Nursing and Health at UESB and the other from the Graduate Program in Biotechnology in Health and Investigative Medicine – CPqGM-Fiocruz) and three undergraduate students from the Department of Health at UESB, scholarship holders of the Scientific Initiation Program; 2) anthropometric measurements performed by a professional and two Physical Education graduates, who, together with a Physiotherapy graduate, applied the functional performance tests. This second stage took place two to three days after the interview, in a space provided by the Municipal Health Department.

To standardize the collection of information, prior to collection, training was carried out for the responsible team through theoretical and practical workshops. Subsequently, from December 2012 to January 2013, a pilot study was conducted in a neighboring municipality of Aiquara, to determine the time required for the interview. In addition, the aim was to resolve possible doubts regarding the completion and adequacy of the form used for data collection.

Anthropometry

Body mass was measured using a portable digital balance (Plenna®). For this purpose, the older people stood barefoot with their arms resting at their side, wearing light clothes and looking straight ahead. Height was measured using a portable stadiometer (WiSO®). The participants were barefoot, with their feet together, heels, buttocks and shoulder girdle against the wall and in an upright position, looking straight ahead.[10] This information was used to calculate the body mass index (BMI = kg/m^2).[11]

Functional performance (predictors)

Functional performance was assessed using handgrip strength (HGS)[12] and the Senior Fitness Test battery.[13] HGS was measured using a hydraulic dynamometer (Saehan Corporation SH5002, 973, Yangdeok-Dong, MasanHoewon-Gu, Changwon 630-728, South Korea), adjusted according to the older person's hand size, so that the first and second finger joints were flexed. The measurement was performed on the dominant arm, with the person sitting, arms close to the body, elbow flexed at 90° and forearm in a neutral position.[12] During the measurement, incentives were given so that the handle of the dynamometer was squeezed as hard as possible. This test was performed twice, with a one-minute interval, and the higher value identified in kilogram-force (kgf) was used for the analyses.[10] The Senior Fitness Test battery was conducted as described in Chart 1.

The evaluators demonstrated the tests to the older adults before their application. Thus, to facilitate the understanding of the movements, the participants performed the tests previously. The final execution of the test, which was recorded, was performed twice with an interval of two minutes. For analysis purposes, the value of the best performance in the tests was taken.[14]

Chart 1 - Objectives, instruments and procedures adopted for the application of the Senior Fitness Test battery in the study population

Test	Objectives, instruments and procedures
Chair stand test	The chair stand test aims to measure the strength and resistance of the lower limbs. It was carried out using a stopwatch and a chair with a backrest (without arms) with a seat height of approximately 43 cm. The execution consisted in sitting down and standing up as many times as possible in 30 seconds.
Arm curl test	Arm curl test measures the strength and resistance of the upper limbs. In this test, a stopwatch, a chair with a backrest (without arms) and dumbbells (2.0 kg for women and 4.0 kg for men) were used. The test consisted in flexing the dominant arm as many times as possible, starting from a neutral position to a complete supine position in a period of 30 seconds.
Timed up and go	The timed up go test aims to assess mobility, agility and dynamic balance. For this purpose, a chair with a backrest (without arms) at a height of approximately 43 cm, a stopwatch, a measuring tape and a cone were used. At the evaluator's command, the participant got up from the chair (they could push their thighs or the chair), walked as fast as possible for 1.22 m, walked around a cone, returned to the chair and sat down. The time in seconds for performing the test was recorded.
Sit and reach test	The sit and reach the feet test assesses the flexibility of the lower limbs and hamstring muscles. For its execution, a ruler of 45 cm was used and a chair without arms, with a backrest at a height of approximately 43 cm to the seat. For this, the participant started with the dominant leg extended, spine erect, head aligned with the spine and hand over hand. Thus, gradually, the older person tried to touch their toes, without flexing the knee. After the older adults reached their maximum points, the distance was measured with the ruler. The distance (cm) observed before reaching the fingertips was registered in a negative way (-) and that reached beyond, in a positive way (+).
Step in place test	The step in place test (stationary walking) was used to measure aerobic resistance. It counted the maximum number of knee lifts that the older people were able to perform in two minutes (without running). The minimum knee height, appropriate in the stride, was leveled at a midpoint between the patella and the anterior superior iliac spine.

Arterial hypertension (outcome)

The outcome analyzed was ascertained through the previous diagnosis, self-reported by the older adults, based on the following question: "Has any doctor ever said that you have hypertension, that is, that you have high blood pressure?". Thus, according to the response, this variable was categorized in a dichotomous way (hypertension: yes or no)..

Adjustment variables

With the purpose of adjustments, the following variables were listed: age (in years); marital status (with or without partner); skin color (white or non-white); schooling (with or without schooling = never went to school and/or did not know how to write their own name); income (≤ 1 or > 1 minimum wage; minimum wage in 2013: R$678.00); tobacco use (yes or no); alcohol use (yes or no); self-reported diagnosis of diabetes mellitus (yes or no); self-perceived health (excellent/very good/good or fair/poor); occurrence of falls in the last twelve months before collection (yes or no); and nutritional status (underweight: BMI < 22.00 kg/m^2, adequate: BMI from 22.00 to 27.00 kg/m^2, overweight: BMI > 27.00 kg/m^2).[11]

In addition, the level of physical activity was considered, determined by the International Physical Activity Questionnaire – IPAQ,[15-17] so that older people who reported spending < 150 minutes in weekly physical activity, at moderate to vigorous intensity, were considered insufficiently active;[18] and exposure to sedentary behavior (SB), assessed from the fifth domain of the IPAQ, which quantifies the time spent in a sitting or leaning position on an ordinary weekday and on a weekend day. The SB weighted mean was calculated as follows: (5 x min/weekday) + (2 x min/weekend day)/7 and the cut-off point adopted for high SB was based on the 75th percentile of weighted mean, with a value of 342.85 min/day (5.71 h/day).[19]

Statistical analysis

The descriptive analysis of the population's characteristics was conducted by calculating relative and absolute frequencies, means, medians, standard deviations and interquartile ranges, in addition to the response percentage for each analyzed variable. The normality distribution of the data was verified by sex, using the Komolgorov Smirnov test. For comparisons, Student's t-test was used for normal distributions and the Mann-Whitney U test for non-normal distributions.

The association between the functional performance indicators and hypertension was verified using multiple Poisson regression models, with estimation, through which the Prevalence Ratios (PRs) and their respective 95% Confidence Intervals (95%CIs) were calculated. For this purpose, all variables listed for adjustments were inserted into the models and subsequently removed one at a time up to a critical level of 10% ($p \leq 0.10$).

Data analyses were performed using the Statistical Package for Social Sciences (IBM-SPSS 21.0, 2013, Inc, Chicago, IL) and the significance level adopted was 5% ($\alpha \leq 0.05$).

Results

The epidemiological investigation was conducted with 209 older people. The mean ages of men and women were, respectively, 72.30 ± 8.13 and 71.05 ± 6.75 years. Furthermore, the characteristics of the study population were as follows: 58.40% were women; 84.70% had no education; 86.70% reported income less than or equal to the minimum wage; 51.70% were classified as insufficiently active; and 58.90% were hypertensive (men: 51.70%; women: 63.90%). Other features of the study population can be seen in Table 1.

Table 2 presents the comparison of the anthropometric characteristics of the study participants. It was found that, in both sexes, hypertensive older individuals had higher weight and BMI compared to non-hypertensives ($p < 0.05$).

Regarding functional performance, comparative analyses showed, in both sexes, that hypertensive older people had lower performance in the TUG test (2.44 m) and in the two-minute STP when compared to non-hypertensives (Table 3).

When analyzing the association of functional performance indicators with hypertension, it was found that each extra second spent in performing the TUG (2.44 m) test increased the probability for the outcome in men by 11% (PR: 1.11; CI95%: 1.03-1.20) and 7% (PR: 1.07; 95%CI: 1.04-1.12) in women. Furthermore, it was found that each additional step taken in SPT decreased (PR: 0.98; 95%CI: 0.97-0.99) the probability of hypertension by 2% in both sexes (Table 4).

Table 1 - Descriptive analysis of the characteristics of the study population (n = 209)

Variables (% response)	**n (%)**
Sex (100%)	
Male	87 (41.60)
Female	122 (58.40)
Age group (100%)	
60-69 years	87 (41.60)
70-79 years	86 (41.10)
≥ 80 years	36 (17.20)
Skin color (97.1%)	
White	31 (15.30)
Not white	172 (84.70)
Education (97.6%)	
Yes	79 (38.70)
No	125 (61.30)
Income (93.8%)	
≤ 1 minimum wage	26 (86.70)
> 1 minimum wage	170 (13.30)
Uses tobaco (100%)	
No	190 (99.99)
Yes	19 (9.10)
Uses alcohol (100%)	
No	163 (78.00)
Yes	46 (22.00)
Nutritional status (99.5%)	
Low weight	49 (23.60)
Adequate	80 (38.50)
Overweight	79 (38.00)
Level of physical activity (100%)	
Sufficient	101 (48.30)
Insufficient	108 (51.70)
Sedentary behavior (100%)	
Normal	152 (72.72)
Elevated	57 (27.28)
Occurrence of falls (98.1%)	
No	175 (85.40)
Yes	30 (14.60)
Diabetes mellitus (100%)	
No	173 (82.80)
Yes	36 (17.20)
Self-perception of health (98.1%)	
Excellent/very good	105 (51.20)
Regular/poor	100 (48.20)
Hypertension	
No	86 (41.10)
Yes	123 (58.90)

Table 2 - Comparison of height, weight and body mass index (BMI) among older persons of both sexes and with and without hypertension

Variables	Men				Variables	Women			
	%	**NH** (n = 42)	**H** (n = 45)	p-value		%	**NH** (n = 44)	**H** (n = 78)	p-value
Height (m)[@]	98.85	1.63 (0.06)	1.63 (0.06)	0.866	Height (m)[@]	100	1.50 (0.06)	1.50 (0.06)	0.910
Weight (kg)[@]	100	62.57 (10.26)	68.38 (9.54)	**0.007**	Weight (kg)[#]	100	57.75 (14.19)	61.40 (20.30)	**0.001**
BMI (kg/m^2)[@]	98.85	23.53 (3.58)	25.74 (3.01)	**0.003**	BMI (kg/m^2)[@]	100	23.97 (4.68)	27.79 (5.48)	**<0.001**

Note: % = percentage of responses; NH = non-hypertensives; H = hypertensives; BMI = body mass index. [@]Mean and standard deviation; [#]Median and interquartile interval. Values in bold indicate $p < 0.05$.

Table 3 - Comparison of functional performance indicators between older persons of both sexes, with and without hypertension

Variables	Men				Variables	Women			
	%	**NH** (n = 42)	**H** (n = 45)	p-value		%	**NH** (n = 44)	**H** (n = 78)	p-value
HGS (kgf)[@]	98.85	33.57 (6.54)	32.81 (7.54)	0.620	HGS (kgf)[@]	99.20	22.23 (4.95)	21.28 (4.87)	0.303
CST (tsu)[#]	93.10	12.00 (3.00)	12.00 (4.00)	0.212	CST (tsu)[#]	92.60	10.00 (4.00)	9.00 (3.00)	0.135
ACT (curls)[#]	87.43	13.00 (6.00)	12.00 (4.00)	0.361	ACT (curls)[#]	90.20	11.00 (5.00)	10.00 (6.00)	0.572
TUG (s)[#]	96.55	5.93 (1.50)	6.50 (2.35)	**0.029**	TUG (s)[#]	95.90	6.47 (2.28)	7.78 (3.32)	**0.002**
SRT (cm)[@]	91.95	-5.51 (11.48)	-8.83 (12.25)	0.216	SRT (cm)[@]	90.20	0.99 (10.57)	-2.25 (13.34)	0.191
SPT (steps)[#]	86.20	89.00 (19.00)	77.00 (2.00)	**0.020**	SPT (steps)[@]	87.70	74.00 (18.00)	63.00 (22.00)	**0.011**

Note: % = percentage of responses; NH = non-hypertensives; H = hypertensives; HGS = handgrip strength; CST = chair stand test; ACT = arm curl test; TUG = timed up and go; SRT = sit and reach test; SPT = step in place test; kgf = kilogram-force; tsu = times stood up; s = seconds. [@]Mean and standard deviation; [#]Median and interquartile interval. Values in bold indicate $p < 0.05$.

Table 4 - Association between functional performance indicators and hypertension in older people, according to sex

Variables	Men			Variables	Women		
	Adjusted PR	(IC95%)	p-value		Adjusted PR	(IC95%)	p-value
HGS (kgf)[a]	0.99	(0.97-1.02)	0.934	HGS (kgf)[b]	0.98	(0.95-1.01)	0.216
CST (tsu)[b]	0.77	(0.51-1.14)	0.508	CST (tsu)[a]	0.97	(0.94-1.01)	0.312
ACT (curls)[a]	0.97	(0.93-1.01)	0.159	ACT (curls)[c]	1.01	(0.96-1.03)	0.953
TUG (s)[a]	1.11	(1.03-1.20)	**0.008**	TUG (s)[d]	1.07	(1.04-1.12)	**<0.001**
SRT (cm)[b]	0.99	(0.98-1.01)	0.697	SRT (cm)[c]	1.01	(0.99-1.01)	0.913
SPT (steps)[a]	0.98	(0.97-0.99)	**0.014**	SPT (steps)[c]	0.98	(0.97-0.99)	**0.004**

Note: PR = prevalence ratio; HGS= handgrip strength; CST = chair stand test; ACT = arm curl test; TUG = timed up and go; SRT = sit and reach test; SPT = step in place test; kgf = kilogram-force; tsu = times stood up; s = seconds. [a]Adjusted by nutritional status and history of falls; [b]Adjusted by nutritional status, history of falls and diabetes mellitus; [c]Adjusted by nutritional status; [d]Adjusted by nutritional status and physical activity level. Values in bold indicate $p < 0.05$.

Discussion

The main results of this epidemiological investigation showed that hypertensive older people of both sexes showed worse performance in the TUG test and in the SPT. Furthermore, it was identified that the longer time spent for TUG increased the probability of hypertension, while a greater number of steps in the SPT attenuated the probability for the outcome in men and women. Thus, the findings of the present study show that hypertensive participants, of both sexes, had less agility, balance, ability to walk and cardiorespiratory resistance when compared to non-hypertensive individuals.

Congruently, Santos et al.[6] oobserved in a cross-sectional sample study, conducted with 52 older people from Natal/RN, that hypertensive participants showed, on average, worse performance in SPT (46.70 ± 11.80 steps) compared to normotensive individuals (56.20 ± 15.50 steps) (p = 0.020). These authors also analyzed TUG performance and showed that hypertensive individuals spent on average more time to perform the test (8.80 ± 1.80 s) compared to normotensive individuals (7.30 ± 1.50 s) (p = 0.004).

Similarly, data from a population survey conducted with 2,733 older people in the United States showed over 18 years of follow-up that hypertensive participants had significantly lower gait speed (0.92 m/s) compared to that observed in non-hypertensive individuals (0.96 m/s). Furthermore, at the end of follow-up, the older adults who entered the cohort with hypertension had a greater decline in gait speed (0.1 m/s per year of follow-up).[4]

In their follow-up, Coelho Jr et al.[5] verified in a cross-sectional sample study, carried out with 378 older women, that normotensive participants had better balance, measured by the unipodal support test (21.80 ± 9.80 vs. 18.40 s ± 10.70 s; p = 0.020), and better performance in the six-minute walk test (573.60 ± 109.70 vs. 549.10 ± 115.60 m; p= 0.040) in comparison to hypertensives. Furthermore, the older women with good performance in the six-minute walk test had a 45% (OR: 0.55; 95%CI: 0.31-0.67) lower chance of having hypertension compared to those with the worst performance.[5]

In view of these results, the aforementioned authors listed some hypotheses to explain this situation. Among them, it appears that people with lower aerobic capacity tend to have a higher level of asymmetric dimethylarginine protein, which inhibits, for example, the synthesis of nitric oxide, an important vasodilator, which provides greater vasoconstriction and the increased arterial blood pressure. On the other hand, greater aerobic capacity is associated with higher plasma levels of antioxidant enzymes, such as glutathione peroxidase, better flow-mediated dilation, less fat and better structure and function of cardiomyocytes, explaining the better performance in tests of cardiorespiratory fitness for non-hypertensive older adults.[5]

It is also noteworthy that hypertension has the potential to cause damage to arteries responsible for transporting blood to the brain. Therefore, chronically, high blood pressure can have deleterious effects in brain areas responsible for controlling movement, limiting the power of muscle contraction.[4,5,20] Furthermore, because it results in greater peripheral vascular resistance, the greater vasoconstriction caused by hypertension may cause lower blood flow to the skeletal muscles, culminating in the reduction of the bioavailability of nutrients and oxygen, which can also compromise muscle contractions and consequently decrease strength.[21,22]

Within this context, physical exercise has been highlighted in the literature for being a protector against hypertension and presenting itself as a low-cost strategy, with few side effects, which can be used as an auxiliary non-pharmacological therapy in the treatment of this morbidity in the older people.[23-26] This considers its positive health effects, such as the decrease in blood pressure and arterial stiffness, improvements in body composition (decreased adiposity and increased muscle mass), improvement in physical fitness indices (increase in muscle strength, agility, flexibility and cardiorespiratory capacity), decrease in fasting blood glucose, and increase in HDL cholesterol (high-density lipoprotein). In addition, physical exercise has repercussions on the reduction of sympathetic tonus and psychological stress, improvement in vascular endothelial function and sodium regulation, and increased parasympathetic tone and arterial compliance.[23,27]

To this end, the American College of Sports Medicine (ACSM) recommends that hypertensive patients perform a minimum of 30 minutes of aerobic activity at moderate intensity (40 to 60% of oxygen consumption - VO_2 reserve) on most days of the week (preferably every day).[28] In addition, the ACSM suggests for hypertensive patients perform resistance exercises as a complement in the training program. In this regard, the Australian Association for Exercise and Sports Science, in its most recent position on the subject, began to recommend that people with hypertension perform two or more days of resistance training, weekly, on non-consecutive days, consisting of eight to ten exercises, with a margin of eight to twelve repetitions, which must be performed at an intensity that generates considerable muscle fatigue.[25]

This study had some limitations. Among them, there is the self-reported diagnosis for the analyzed outcome. However, the use of MMSE is highlighted as an exclusion criterion for older people with cognitive impairment, to reduce the impact of memory bias. In addition, it should be noted that the results presented refer to the panorama verified during the data collection carried out in 2013, which may not reflect the current situation.

However, the originality of the present study stands out as a strong point, since it was the first Brazilian population survey to analyze the association of functional performance indicators with hypertension, focusing on the older population of a small municipality, in the Northeast region of the country, which has low socioeconomic indicators and difficulties in providing health services.[14] Therefore, it is believed that the evidence presented can be of health for the measures taken by health professionals working in the scope of primary health care promoting interventions aimed at improving or maintaining good levels of physical fitness in the older adults, both for the prevention of hypertension and to mitigate its potential deleterious impact on functional performance in these people, especially regarding the ability to walk and cardiorespiratory resistance.

Conclusion

There was evidence that, in both sexes, hypertensive participants showed worse performance in the TUG test and in SPT. Furthermore, TUG was positively associated with hypertension, while SPT showed an inverse association.

The results of the present study, therefore, show that hypertensive older individuals had less agility, balance, ability to walk and cardiorespiratory resistance when compared to non-hypertensive individuals. Faced with these findings, there is a need to adopt measures aimed at preventing hypertension and minimizing its possible adverse effect on the functional performance of the older adults. Among the possible non-pharmacological strategies, we highlight physical exercises of an aerobic nature and also counter-resistance exercises.

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Authors' contributions

ESS, LS, SSC, DJS, YSS, PFVN and CAC participated in the project conception, study design, data collection, writing and critical review of the manuscript. Furthermore, LS and ESS carried out the analysis and interpretation of the results. All authors declare that there is no conflict of interest and approved the final version of the manuscript. In addition, they are responsible for all aspects of the work, including ensuring its accuracy and completeness.

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