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Original Article

FACTORS ASSOCIATED WITH DYNAPENIA IN OLDER ADULTS IN THE NORTHEAST OF BRAZIL

FATORES ASSOCIADOS À DINAPENIA EM IDOSOS DO NORDESTE BRASILEIRO

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ABSTRACT
This study identified factors associated with dynapenia in older adults residing in a small town in northeastern Brazil. It is a population-based study conducted with 208 senior citizens (58.7% women) from Aiquara, BA. Sociodemographic, behavioral and health information were obtained from face-to-face interviews, and nutritional status was assessed by body mass index. To measure their level of physical activity and sedentary behavior, the International Physical Activity Questionnaire was used. Dynapenia was diagnosed by sex, from the 25th percentile of handgrip strength, by means of a hydraulic dynamometer. For inferential analyses, Poisson regression was used, with a robust estimator, calculation of Prevalence Ratios (PRs) and their respective 95% Confidence Intervals (CIs). The prevalence of dynapenia was higher in older adults aged 70-79 (PR: 3.21; 95%CI: 1.55-6.64) and ≥80 years (PR: 4.91; 95%CI: 2.32-10.39), in those with low weight (PR: 2.20; 95%CI: 1.26-3.82), in those who are insufficiently active (PR: 1.99; 95%CI: 1.12-3.54), and among those with high level of sedentary behavior (PR: 1.88; 95%CI: 1.19-2.98). The factors identified as being associated with dynapenia were: age between 70 and 79 and ≥80 years, insufficient level of physical activity; high level of sedentary behavior, and low weight.
Keywords: Aging. Epidemiology. Muscle strength.

RESUMO
Este estudo identificou os fatores associados à dinapenia em idosos residentes em um município de pequeno porte do Nordeste brasileiro. Trata-se de um estudo populacional, conduzido com 208 idosos (58,7% mulheres) de Aiquara-BA. As informações sociodemográficas, comportamentais e de condições de saúde foram obtidas em entrevistas face a face, e o estado nutricional foi avaliado pelo índice de massa corporal. Para mensuração do nível de atividade física e do comportamento sedentário, utilizou-se o *International Physical Activity Questionnaire*. O diagnóstico da dinapenia foi realizado por sexo, a partir do percentil 25 da força de preensão manual, averiguada com um dinamômetro hidráulico. Para análises inferenciais foi utilizada a regressão de Poisson, com estimador robusto, cálculo das Razões de Prevalência (RP) e de seus respectivos intervalos de confiança de 95% (IC). A prevalência de dinapenia foi maior nos idosos com idade entre 70-79 (RP: 3,21; IC95%: 1,55-6,64) e ≥80 anos (RP: 4,91; IC95%: 2,32-10,39), nos com baixo peso (RP: 2,20; IC95%: 1,26-3,82), nos insuficientemente ativos (RP: 1,99; IC95%: 1,12-3,54) e entre os com elevado comportamento sedentário (RP: 1,88; IC95%: 1,19-2,98). Identificou-se que os fatores associados à dinapenia foram: idade entre 70-79 e ≥80 anos, nível de atividade física insuficiente; elevado comportamento sedentário e baixo peso.
Palavras-chave: Envelhecimento. Epidemiologia. Força muscular.

Introduction

Aging comes along with increasing changes in functional performance, so certain activities, considered habitual, such as getting up from a bed or chair independently, become increasingly difficult[1], until it is no longer possible to perform them[2]. These changes are the result of progressive declines in muscle fitness, attributed to factors of neurological and muscle mechanisms, which provide a condition of muscle weakness, called dynapenia[3,4].

The prevalence of dynapenia appears to vary according to the context and the characteristics of individuals, with a rate of 17.8% in the European older population[5], 25.1% in the Korean older population[6], and in the order of 24.0 and 21.5% among Canadian older women and men[7], respectively. In Brazil, population-based research shows that dynapenia is frequent among older people, with a prevalence of 17.2% being reported in *the Estudo Longitudinal de Saúde dos Idosos Brasileiros*[8], and 30.9% in the *Saúde Bem-estar e Envelhecimento* population survey[9].

This epidemiological panorama refers to an important public health problem, considering that dynapenia causes older adults to be more prone to low mobility[10], falls, fractures[11], hospitalizations and mortality[12]. Furthermore, said outcome has been shown to be associated with physical incapacity and chronic diseases, regardless of muscle mass[8].

In view of this, handgrip strength (HGS) has been presented as an important tool to diagnose dynapenia, due to its low cost, easy application and interpretation[13]. However, it is observed that, in Brazil, most health surveys for this purpose have been carried out in large urban centers, mainly in the south and southeast regions[9,14,15,16,17].

In the northeast region, only one study conducted in a small urban center (<5,000 inhabitants), with rural characteristics, was found. However, it was limited to verifying the association of dynapenia with the sex and age group of older adults[18]. Therefore, the need to carry out epidemiological research is justified, with the perspective of investigating, in the older population, the groups in which dynapenia is more prevalent, since this information can be used, in primary health care, as subsidies for the early identification of older adults in conditions of greater probability for adverse outcomes, and direct the planning and execution of actions to promote and recover the health of this population. Thus, the objective of the present study was to identify factors associated with dynapenia in older adults living in a small municipality of northeastern Brazil.

Methods

Study design, location and population

This is a population-based study, with a cross-sectional design, based on data from the Baseline of the epidemiological and census survey entitled: "*Condições de saúde e estilo de vida de idosos residentes em município de pequeno porte: coorte Aiquara[19]"*, carried out between February and March 2013 in Aiquara, a small municipality (4,767 inhabitants) located in the south-central region of the state of Bahia. This research was conducted with older adults registered in the only unit of Aiquara's *Estratégia Saúde da Família (ESF)*, which covers 100.0% of the town's population.

Eligibility criteria

Initially, a census was carried out in the urban area of the municipality, from the list of older adults registered in the *ESF*. In this way, all households were separated by the area covered by the community health agents and visited in order for the older adults to be identified. For participation in the research, the following inclusion criteria were adopted: age ≥ 60 years; not being institutionalized; having a fixed residence in the urban area; sleeping four days or more at home. However, the study excluded those who had a cognitive deficit, assessed by the Mini Mental State Examination (MMSE) (< 13 points)[20]; or who had previous neurological diseases, hearing problems, or who were bedridden.

All who met the established criteria were informed and clarified about the research objectives and signed the Free and Informed Consent Term. In this way, data were collected from 232 older adults[21]. However, for the present study, 24 were excluded for not undergoing the HGS measurement.

Data collection

The first stage of data collection consisted of a face-to-face interview held in the homes of the older adults, where sociodemographic, behavioral and health information was collected. Afterwards, the second part of the research was scheduled in a period of two to three days, depending on their availability. This stage consisted of measuring the HGS, in a space provided by the Municipal Health Department of Aiquara, BA.

Independent variables (predictors)

Sociodemographic variables: sex (male or female), age group (60-69, 70-79, ≥80 years), skin color (black or non-black (white, brown and yellow)), education (with or without education (never went to school and/or did not know how to write their own name), family arrangement (living alone or with other people), marital status (married/stable union, single/separated or widowed), income ≤ 1 minimum wage or > 1 minimum wage; minimum wage in 2013: R$ 678.00).

Behavioral variables: tobacco use (yes or no), alcohol consumption in the last 30 days before collection (yes or no), level of physical activity (PA), verified through the first four domains of the long version of the International Physical Activity Questionnaire (IPAQ)[22], an instrument validated for Brazilian older adults[23,24]; those who had a weekly time of < 150 minutes of moderate to vigorous PA were considered insufficiently active[25].

Sedentary behavior (SB) was quantified by the fifth domain of the IPAQ, which considers time spent sitting on a regular weekday and on a weekend day. The SB weighted mean was calculated as follows: (5 x min/weekday) + (2 x min/weekend day) /7). The cutoff point adopted for high SB was based on the 75th percentile of the weighted mean, with a value of 342.85 min/day (5.71 hours/day).

Health conditions: previous diagnosis of arterial hypertension and/or diabetes *mellitus* (yes or no), occurrence of falls in the last 12 months before collection (yes or no), self-perception of health (excellent/very good/good, regular or poor), and nutritional status, assessed by body mass index [BMI = (body mass/(height^2))], which was categorized as follows: low weight = BMI < 23.0 kg/m^2; eutrophy = BMI from 23.0 to 28.0 kg/m^2; overweight/obesity = BMI > 28.0 kg/m^2, according to the Pan American Health Organization[26].

Body mass was measured using a portable digital scale (Plenna®). The participants stood barefoot, with their arms relaxed along the body, looking ahead, wearing light clothes. Height was measured using a portable stadiometer (WiSO®); the subjects were barefoot, in an upright position, with their feet together, heels, buttocks and shoulder girdle in contact with the wall, and with their eyes fixed on a horizontal axis parallel to the floor (Frankfurt Line) during inspiratory apnea[27].

Dependent variable (outcome)

The HGS was measured using a Saehan brand, SH5002® handheld hydraulic dynamometer (Saehan Corporation, 973, Yangdeok-Dong, MasanHoewon-Gu, Changwon 630-728, South Korea). The test was performed on the dominant limb of the older adults, who remained seated, with the arm close to the body, elbow flexed at 90º, and forearm in a neutral position. In addition, the dynamometer was adjusted in accordance with the size of the participant's hand, in a way that the first and second finger joints were flexed[28].

During the test, the older adults were encouraged to press the dynamometer handle with as much force as possible. The test was performed twice, with an interval of one minute, and the highest value identified in kilogram-force (kgf) was used for the analyses. The diagnosis of dynapenia was stratified by sex, with a cut-off point set at the 25th percentile of the HGS (women: 18.37 kgf; men: 26.75 kgf)[29].

Statistical analysis

The description of the population was based on the calculation of absolute and relative frequencies, mean and standard deviation. For the inferential analyses, initially, bivariate investigations were carried out using Poisson regression, with a robust estimator, through which the Prevalence Ratios (PRs) and their respective 95% Confidence Intervals (CIs) were calculated.

The variables that showed a significance level lower than or equal to 20.0% ($p \leq 0.20$) were considered for inclusion in the multivariate analysis, in a hierarchical model, where sociodemographic aspects constituted the most distal level (Level 1), behaviors, the intermediate level (Level 2), and health conditions, the most proximal level (Level 3) (Figure 1).

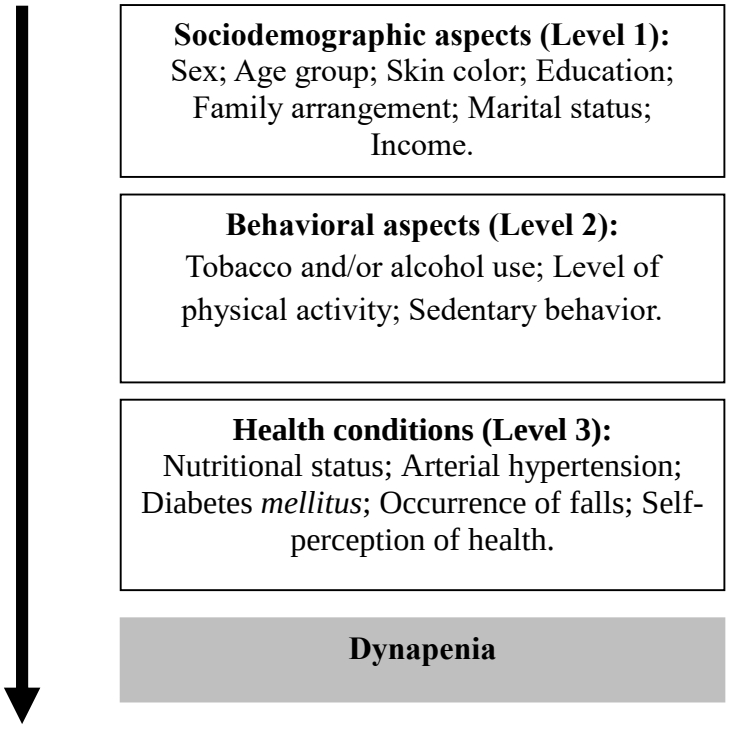

Figure 1. Flowchart of the hierarchical model used to identify factors associated with dynapenia in older adults. Aiquara, BA, Brazil, 2013.
Source: Authors

The construction of the model started from the variables at the most distal level, and later, the subsequent levels were gradually added. Thus, intra- and inter-level adjustments were made, with only those variables that maintained a p value ≤ 0.20, verified by the Wald test for heterogeneity, remaining in the model. However, independent variables that showed a significance level ≤ 5.0% were considered factors associated with dynapenia. Data analyses were performed using the Statistical Package for Social Sciences (IBM-SPSS® 21.0, 2013, Inc, Chicago, IL).

Ethical aspects

This research was carried out in accordance with the ethical principles of the World Medical Association's Declaration of Helsinki and in accordance with the Brazilian National Health Council's Resolution No. 466/2012. Therefore, it was approved by the State University of Southwestern Bahia's Research Ethics Committee, under opinion No. 171.464/2012 and CAAE No. 10786212.3.0000.0055.

Results

Study conducted with 208 older adults (58.7% women). The mean ages of women and men were, respectively, in the order of 71.0 ± 6.7 and 72.3 ± 8.1 years. The prevalence of dynapenia observed was 24.5%. Furthermore, it was found that 61.6% of the participants had no education, 87.2% had an income ≤ 1 minimum wage, 51.4% had an insufficient level of PA, and 59.1% were hypertensive. Other characteristics of the population are shown in Table 1.

Table 1. Descriptive analysis of sociodemographic aspects, behavioral aspects and health conditions of the older adults participating in the study. Aiquara, BA, Brazil. 2013.

Variable	% of response	n	%
Sex	100.0		
Female		112	58.7
Male		86	41.3
Age group	100.0		
60-69 years		86	41.3
70-79 years		86	41.3
≥80 years		36	17.4
Skin color	97.1		
Black		53	26.2
Non-black		149	73.8
Education	97.6		
No		125	61.6
Yes		78	38.4
Family arrangement	99.5		
Living with other people		176	85.0
Living alone		31	15.0
Marital status	100.0		
Married/stable union		113	54.3
Single/separated		37	17.8
Widowed		58	27.9
Income	93.8		
> 1 minimum wage		25	12.8
≤ 1 minimum wage		170	87.2
Tobacco smoking	100.0		
No		189	90.9
Yes		19	9.1
Alcohol use	100.0		
No		162	77.9
Yes		46	22.1
Level of physical activity	100.0		
Sufficient		101	48.6
Insufficient		107	51.4
Sedentary behavior	100.0		
Normal		146	73.7
High		52	26.3
Nutritional status	99.5		
Low weight		62	30.0
Eutrophy		84	40.6
Overweight/obesity		61	29.5
Arterial hypertension	100.0		
No		85	40.9
Yes		123	59.1
Diabetes *mellitus*	100.0		
No		172	82.7
Yes		36	17.3
Occurrence of falls	98.1		
No		174	85.3
Yes		30	14.7
Self-perception of health	98.1		
Excellent/very good/good		105	51.5
Regular		76	37.3
Poor		23	11.2

Note: %: percentage; n: number of participants
Source: Authors

Table 2 shows the prevalence of dynapenia in the older adults, in accordance with the independent variables analyzed. It was found that age group, skin color, education, marital status, tobacco smoking, level of PA, SB, nutritional status, and self-perception of health had a significance level < 20.0%. Therefore, they were selected for multivariate analysis.

Table 2. Prevalence of dynapenia in older adults, in accordance with sociodemographic aspects, behavioral aspects and health conditions. Aiquara, BA, Brazil, 2013.

Variables	Prevalence of dynapenia (%)	Gross PR	(95%CI)	p value*
Sex				0.977
Female	24.6	1		
Male	24.4	0.99	(0.61-1.61)	
Age group				**<0.001**
60-69 years	9.3	1		
70-79 years	29.1	3.12	(1.49-6.53)	
≥80 years	50.0	5.37	(2.57-11.22)	
Skin color				**0.049**
Non-black	20.8	1		
Black	34.0	1.63	(1.01-2.66)	
Education				**0.008**
No	30.4	2.37	(1.25-4.48)	
Yes	12.8	1		
Family arrangement				0.268
Living with other people	23.3	1		
Living alone	33.2	1.38	(0.77-2.46)	
Marital status				**0.040**
Married/stable union	21.2	1		
Single/separated	16.2	0.76	(0.33-1.72)	
Widowed	36.2	1.70	(1.04-2.79)	
Income				0.890
> 1 minimum wage	24.0	1		
≤ 1 minimum wage	25.3	1.05	(0.50-2.21)	
Tobacco smoking				**0.185**
No	25.9	1		
Yes	10.5	0.40	(0.10-1.54)	
Alcohol use				0.223
No	26.5	1		
Yes	17.4	0.65	(0.33-1.29)	
Level of physical activity				**<0.001**
Sufficient	12.9	1		
Insufficient	35.5	2.75	(1.56-4.86)	
Sedentary behavior				**0.003**
Normal	19.9	1		
High	40.2	2.03	(1.27-3.23)	
Nutritional status				**0.008**
Eutrophy	17.9	1		
Low weight	38.7	2.16	(1.24-3.77)	
Overweight/obesity	19.7	1.10	(0.55-2.18)	
Arterial hypertension				0.549
No	22.4	1		
Yes	26.0	1.16	(0.70-1.91)	
Diabetes *mellitus*				0.941
No	24.4	1		
Yes	25.0	1.02	(0.54-1.91)	
Occurrence of falls				0.818
No	24.7	1		
Yes	26.7	1.07	(0.56-2.06)	
Self-perception of health				**0.048**

Excellent/very good/good	22.9	1	
Regular	21.1	0.92	(0.52-1.61)
Poor	43.5	1.90	(1.06-3.41)

Note: %: percentage; PR: prevalence ratio; CI: confidence interval; *Wald test
Source: Authors

However, after intra- and inter-level adjustments, the education, marital status, tobacco smoking and self-perception of health variables showed a value of p>0.20. Therefore, they were removed from the regression model, which, in its final version, showed that dynapenia was associated with older adults aged 70 to 79 (PR: 3.21; 95%CI: 1.55-6.64) and ≥80 years (PR: 4.91; 95%CI: 2.32-10.39), those who were insufficiently active (PR: 1.99; 95%CI: 1.12-3.54), those with high level of SB (PR: 1 .88; 95%CI: 1.19-2.98), and those evaluated with low weight (PR: 2.20; 95%CI: 1.26-3.82) (Table 3).

Table 3. Final hierarchical model of the association between dynapenia and the independent variables in the study population. Aiquara, BA, Brazil, 2013.

Level	Variables	Adjusted PR	(95%CI)	p value*
1	**Age group**			**<0.001**
	60-69 years	1		
	70-79 years	3.21	(1.55-6.6)	
	≥80 years	4.91	(2.32-10.39)	
	Skin color			0.052
	Non-black	1		
	Black	1.59	(0.99-2.54)	
2	**Level of physical activity**			**0.018**
	Sufficient	1		
	Insufficient	1.99	(1.12-3.54)	
	Sedentary behavior			**0.007**
	Normal	1		
	High	1.88	(1.19-2.98)	
3	**Nutritional status**			**0.016**
	Eutrophy	1		
	Low weight	2.20	(1.26-3.82)	
	Overweight/obesity	1.60	(0.79-3.25)	

Note: %: percentage; PR: prevalence ratio; CI: confidence interval; *Wald test
Source: Authors

Discussion

This study identified the following variables as factors associated with dynapenia in older adults from a small municipality in northeastern Brazil: age group, level of physical activity, sedentary behavior, and nutritional status.

In this context, a study conducted with 1,168 older adults from São Paulo, SP, observed that the participants aged between 70 and 79 and those aged 80 years or older were, respectively, 1.99 (95%CI: 3.71-10.11) and 6.13 (95%CI: 2.84-7.74) more likely to suffer from dynapenia, compared to those in the 60-69 age group[9].

Similarly, a study carried out with 203 older adults registered in a Basic Health Unit in Curitiba, PR[15], evidenced a higher prevalence of dynapenia in those in the age groups aged ≥80 years (73.3%), in relation to that observed in younger senior citizens (60-69 years: 43.0%) (p = 0.0120). Similar results were found in other epidemiological studies conducted in Rio de Janeiro, RJ[16], São Caetano do Sul, SP[17], Florianópolis, SC[14], and Curitiba, PR[15].

In parallel to aging, important changes occur both in the nervous system and in the muscular system, which, together, can generate implications in terms of muscle strength. The

main ones include progressive decreases in excitatory impulses from the supraspinal centers and in the ability to recruit large motor units, as well as in their reinnervations[30,31].

Moreover, there is a decline in mitochondrial capacity, in the number of muscle fibers, and in cross-sectional areas, as well as an increase in oxidative stress and a decrease in functionality in satellite cells. Such repercussions tend to become increasingly severe during longevity[30,32]. For this reason, older people at a more advanced age probably have a higher prevalence of dynapenia compared to younger ones[13].

Among older adults living in the urban area of Aiquara, BA, it was identified that nutritional condition also seems to influence the prevalence of dynapenia, since it was higher among those evaluated with low weight. This result corroborates those obtained in São Paulo, SP[9], where malnourished older adults, identified by the Mini Nutritional Assessment, a multidimensional method composed of 18 questions grouped into four parts – anthropometry (body mass index, weight loss, arm and calf circumference), – were 2.63 (95%CI: 1.04-6.64) more likely to be dynapenic compared to eutrophic ones.

This evidence refers to the considerable interference that nutritional condition appears to exert on level of muscle strength, given that older adults with low weight tend to have a low caloric intake, which, in its turn, activates the immune system and increases the release of inflammatory cytokines, resulting in a severe catabolic state, especially affecting muscle mass, potentiating declines in its contingents[31,32].

In this context, a literature review showed that international guidelines have pointed to the relevance of a more robust protein intake for the improvement or maintenance of muscle structure and function throughout aging. Thus, in Australia, the daily recommendation for healthy older adults is around 1.1-1.2 grams per kilogram (g/kg) of body mass per day. In Nordic countries, between 1.1-1.3 g/kg/day is recommended. Similar values are recommended by the Society for Sarcopenia, Cachexia and Wasting Disease (1.0-1.5 g/kg/day), the European Union Geriatric Medicine Society (≥ 1.2 g/kg/day), and the European Society for Clinical Nutrition and Metabolism (1.2-1.5 g/kg/day)[33].

At the national level, the Brazilian Society of Parenteral and Enteral Nutrition (BRASPEN) recommends, for older adults, an overall protein ingestion close to those observed internationally (1.0-1.2 g/kg/day), in an intake of 30 to 35 Kcal/kg/day. However, BRASPEN stresses that, for malnourished or chronically ill older adults, a higher ingestion (1.2-1.5 g/kg/day) is of paramount importance, which can reach 2.0 g/kg/day in cases of serious morbidities, where the decline of skeletal muscles is faster, as a consequence of high catabolism[34].

Nevertheless, habitual PA has also been shown to be a considerable factor influencing the level of muscle strength in older adults. From this perspective, a population-based study conducted with 391 older women living in Florianópolis, SC[14], found that sufficiently active participants were 55.0% less likely to be dynapenic (OR: 0.45; 95%CI: 0.25-0.82).

Congruently, cross-sectional data from the UK Biobank, a study involving 66,582 English older adults, showed that participants in the highest quintile of time spent on moderate PA (55.50 min/day), also assessed using the IPAQ, had on average a HGS 1.28 kgf (95%CI: 1.08-1.48) greater than that of those in the lowest quintile (42.87 min/day) ($p < 0.001$). Additionally, it evidenced that older adults in the highest HGS quintile (31.34 kgf) spent an average of 12.63 (95%CI: 10.22-15.05) more minutes of PA per day compared to those evaluated in the lowest quintile (30.06 kgf)[35].

Given this scenario, regular PA is shown to be a possible non-drug intervention to improve or maintain muscle strength during aging. Among the modalities for this purpose, resistance training is highlighted as one of the most important. Thus, the National Strength and Conditioning Association recommends, for older adults, between two to three days of resistance

training, in sessions consisting of 8-10 exercises, which should be performed progressively until reaching an intensity in the order of 70.0 to 85.0 % of a maximum repetition[36].

In addition to insufficient level of PA, in Aiquara, BA, a high SB also provided a higher probability of the outcome studied. As far as we know, the present study is the first nationwide to investigate the association between said health risk behavior and dynapenia in older adults. Checking the international scenario, it was possible to identify that this relationship is still under construction, with some epidemiological studies having observed the association of dynapenia only with some sedentary activities, and not based on total time[37,38].

The study conducted from the English Longitudinal Study of Aging cohort, involving 6,228 older adults, analyzed the relationship of daily TV time and internet use with HGS. The results showed that time spent on sedentary activities was inversely associated with strength; participants who watched TV for ~6 hours/day had a lower HGS compared to those with only 2 hours/day. However, this result was not congruent, as it lost the positive association effect after the adjustments were applied[37].

Another study, carried out with 390,089 English older adults, investigated the association of screen time, muscle strength and mortality. Its findings revealed that discretionary screen time (> 5 hours/day) was associated with dynapenia (HR: 1.31; 95%CI: 1.22-1.43) and that the presence of preserved muscle strength attenuated the risk of mortality in those evaluated with high exposure to sedentary activity (HR: 1.04; 95%CI: 0.95-1.14)[38].

The relationship between muscle strength level and SB is not fully elucidated in the literature. What is already known is that there is an interference of stationary time on muscle fitness, that is, of time spent on sedentary activities in a prolonged manner, with consequent physiological changes in skeletal muscle[39]. In addition to decreasing muscle strength and mass, due to disuse of the locomotor system, high level of SB can potentiate a greater accumulation of fat mass and its infiltration into muscle tissue, weakening its power of contraction and stimulation[40].

This study has some limitations, with highlight to the use of self-reported measures to obtain the time spent on PA and exposure to SB. However, the use of the MMSE as a screening tool for cognitive impairment is worth noting, as it aimed to minimize the impact of memory bias in obtaining the acquired information.

On the other hand, its strengths include the method used to measure muscle strength and its census perspective, which allowed the evaluation of a representative contingent of an older population residing in a small town in the Northeast of Brazil, which presents poor sociodemographic indicators. Thus, the results found may support the execution of health surveillance actions aimed at identifying older adults more prone to dynapenia, thus enabling early interventions and the recovery of health conditions.

Conclusions

In older adults residing in the urban area of municipality of Aiquara, BA, dynapenia was associated with age between 70 and 79 and ≥80 years, insufficient level of physical activity, high level of sedentary behavior, and low weight.

This calls for the need to adopt measures aimed at improving the level of muscle strength in these groups, such as a balanced diet with a proper number of proteins, regular engagement in physical activity, especially resistance exercises with external loads, and a shorter time of exposure to sedentary activities.

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