

# Functional capacity of diabetic older adults living in a municipality in Northeastern Brazil

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**Abstract**— *Diabetes Mellitus is a disease that contribute to the loss of functional capacity in older adults. This study aimed to measure diabetic older adults' functional capacity for activities of daily living (ADL) and instrumental activities of daily living (IADL). We carried out a descriptive and analytical cross-sectional study with older adults aged 65+ years at a specialized health care center of Brazil. The medical records of the patients were selected using non-probability sampling. In this study was found, significantly statistical, higher prevalence in ADL among persons aged 75+ years, those with low levels of education and relation between self-rated current health status. For dependence in IADL, it was common among 75+ years old people, those with lower levels of education, with income of up to 2 minimum wages and worse self-rated health. There is a need to work on public policies that contribute to active and successful aging by promoting the autonomy and functional independence of older adults in the household and community.*

**Keywords**— *Brazil; Diabetes mellitus; Geriatric medicine; Functional capacity.*

## I. INTRODUCTION

Healthy aging is defined as including three main components: low probability of disease and functional disability, high cognitive and physical functional capacity and active engagement with life (Rowe & Kahn, 1997). Thus, health aging is much more than just the absence of disease; it includes the preservation of functionality (World Health Organization, 2015)

Increased life expectancy points to the need to ensure that people not only live longer lives, but live healthier, active and independent lives. Therefore, it is necessary to put sustainable health care solutions into practice to tackle the potential increase in chronic diseases, cognitive decline or dependence and its consequences (Gomez et al., 2013).

Population aging has been accompanied by an increase in the incidence of noncommunicable diseases, particularly diabetes mellitus (DM), whose prevalence in the older population has been increasing due to the greater life expectancy of the population and increased survival of patients (Oliveira et al., 2017; Shaw et al., 2010; Wild et al., 2004).

In Brazil, nationwide data show that the incidence of DM increases with age as the rates range from 17.1% among men and 14% among women in people aged 55-64 years to 22.7% among men and 21.7% among women in people aged 65+ (Brasil, 2010).

Diabetes Mellitus is one of the top five non-communicable diseases that most contribute to the loss of functional capacity in instrumental activities of daily living (IADL) (Griffith et al., 2017)

Researchers have reported that people with type 2 diabetes mellitus are at an increased risk of inability to perform activities of daily living as some comorbidities associated with diabetes can impair individual functionality (Araki & Ito, 2009). In addition, hyperglycemia increases dehydration, impairs vision and cognition and increases the risk of infection (Ismail-Beigi et al., 2011), which further contributes to functional decline.

It should be noted that changes in plantar sensitivity caused by diabetes interfere with the balance of older patients, thereby increasing the risk of falls, and decreased visual

acuity can lead to increased dependence on activities of daily living (Berger & Porell, 2008; Corriveau et al., 2004).

Two scales are relevant for clinical practice as they assess the level of dependence in older people. The first one is the Katz scale, which was first developed in 1963 to assess activities of daily living (ADL) in hospitalized patients and then adjusted for use with the general population. This scale was developed based on the premise that functional loss follows a pattern of decline in which the ability to bathe is lost first and followed by the ability to dress, transfer and feed, with rehabilitation occurring in reverse order. The Portuguese version of the Katz Scale underwent cross-cultural adaptation and proved to be equivalent to the original in English, thus facilitating its use in Brazil (S. Katz et al., 1970; Sidney Katz et al., 1963; Lino et al., 2008). The second scale is the Lawton & Brody Scale, which is widely used to assess instrumental activities of daily living (IADL), including more complex activities that allow them to live in the community (M. Lawton & Brody, 1969; R. L. Santos & Júnior, 2008).

Thus, assessing functional capacity in older people with diabetes mellitus, which is the objective of the present study, allows to identify the physical and social needs of this population group and contributes to the elaboration of public policies and the development of health promotion and disease prevention and control strategies focused on functional impairment, which is a common problem in the older population.

## II. METHODS

This descriptive and analytical cross-sectional study was carried out with older adults (65+ years old) receiving specialized care from Brazil's Unified Health System in the city of Fortaleza, Northeastern Brazil.

The study was conducted at a Center for Integrated Diabetes and Hypertension Care (*Centro Integrado de Diabetes e Hipertensão – CIDH*). CIDH is a reference center for Diabetes and Hypertension specialized care in the state of Ceará and it provides secondary health care for complications related to these diseases.

The sample size was estimated considering the number of older people (N=242,430) in the city of Fortaleza according to the 2012 DATASUS Report (Saúde, 2012). The formula for a finite population was used and the minimum sample size estimated was 246 older adults. The medical records of the patients were selected using non-probability sampling according to their original reference numbers. We selected one out of every eight records as there were 1978 older people aged 65 years and older who

have had diabetes for at least one year enrolled in the CIDH.

Inclusion criteria were people aged 65 years or older who have had diabetes mellitus for at least one year and who agreed to participate. Older adults with type 1 diabetes were excluded from the study.

Interviewers and data collectors were previously trained to apply the following data collection instruments:

a) Identification form, which collected sociodemographic data (age, gender, marital status, level of education, income and retirement) and general health data (systemic diseases, cognitive problems, foot ulcer, use of medications, smoking, and drinking).

b) The Katz Activities of Daily Living (ADL) scale, which assesses performance in six self-care activities, namely bathing, dressing, toileting, transferring, continence, and feeding. The dependent variable was older adults' functional ability to perform ADL. The older adults were then classified as independent – when they needed assistance in only one activity or in none of them – and dependent – when they needed assistance in two or more activities.

c) The Lawton and Brody Instrumental Activities of Daily Living (IADL) scale, which assesses eight variables related to mobility skills (using a telephone, going to distant places using some mode of transportation, shopping, housekeeping, doing the laundry, cooking, taking medication and handling finances). These skills are related to older adults' effective participation in the community and difficulties in performing them leads to a redistribution of tasks among family members who live with the older person (Lebrão & Laurenti, 2005). There are three response options for each activity on the scale, with a maximum score of 27 points. The score should be interpreted individually and the decline over time reveals deterioration. The lower the score on the scale, the worse the functional ability to perform IADL. The scale has not been validated for the Brazilian population; therefore, in some cases, a person's inability to perform tasks that are not usual (such as cooking) should be taken into consideration as it might impair the analysis of independence (M. Lawton & Brody, 1969; M. P. Lawton, 1971). For data analysis, the results were grouped into three categories: 27 points – independence, 26-18 points – partial dependence, and below 18 points – dependence (Pinto et al., 2016).

The results were organized and consolidated using the Statistical Package for the Social Sciences, Co. Chicago IL USA (SPSS) for Windows (version 23.0). Quantitative variables were described as means and standard deviations

and qualitative variables were described as absolute and relative frequencies. The association between independent variables and functional capacity was assessed using the Chi-squared test or Fisher's exact test. The magnitude of the association was expressed as point and interval estimates of prevalence ratios. All the inferential analyses were performed considering a significance threshold of 5%.

This study was authorized by the CIDH and approved by the Research Ethics Committee of the University of Fortaleza (Approval No. 1.666.717).

### III. RESULTS

A total of 248 older adults were analyzed: 140 women (56.5%) and 108 men (43.5%). The mean age of the participants was  $73.16 \pm 6.4$  years.

Most of the participants were married (142; 58.4%), retired (232; 93.5%), and lived in their homes (246; 99.2%). Just over half of them (131; 52.8%) had incomplete primary education, 17 (7; 6.9%) had higher education, and 176 (73.9%) earned up to two minimum wages.

Table 1 shows the risk factors for greater dependence in ADL. People aged 75 years or older had a 2.75-fold higher prevalence of dependence in ADL than their younger peers ( $p=0.002$ ). Older adults with low levels of education had a 6.7-fold higher prevalence of dependence in ADL than those with high levels of education ( $PR=6.69$ ;  $p=0.010$ ). Older adults who earned up to two minimum wages (MW) had a 2.16-fold higher prevalence of dependence in ADL compared with those who earned more than 2 MW.

Table 2 shows statistically significant associations between dependence in ADL and self-rated health at the time of the study ( $p=0.002$ ) and in the past year ( $p=0.038$ ). The older adults who rated their health as poor exhibited a 2.47-fold prevalence of dependence in some ADL when compared with those who rated their health as fair.

With regard to clinical data, dependence in ADL was significantly higher among people with a history of stroke ( $PR=2.42$ ;  $p=0.036$ ), self-reported cognitive problems ( $PR=4.15$ ;  $p=0.001$ ) and underweight measured by the BMI ( $PR=2.42$ ;  $p<0.039$ ).

Table 3 shows the sociodemographic and behavioral characteristics of the older adults according to the level of functional ability to perform IADL. In all, 18.9% ( $n=47$ ) of the participants were dependent and 51.6% ( $n=128$ ) were partially dependent. The participants classified as dependent in IADL were over 75 years of age, had low levels of education and earned up to 2 minimum wages.

A total of 34.9% of the participants aged 75+ and 10.5% of those aged 65-74 years were dependent in some IADL ( $p<0.001$ ). Additionally, dependence in IADL was observed in 25.7% of the illiterate participants and 3.8% of the participants with high levels of education ( $p<0.001$ ). Dependence in IADL was also found in 19.3% of the participants who earned less than 2 MW and in 10.9% of those who earned more than 2 MW ( $p=0.011$ ) (Table 3).

Table 4 shows the distribution of clinical characteristics of the older adults according to the level of functionality in IADL.

With regard to self-rated health in the past year, 26.5% of the participants who rated their health as worse and 16.1% of those who rated their health as better were dependent in IADL ( $p=0.019$ ).

As for clinical aspects, older adults' dependence in IADL was significantly associated with previous history of stroke ( $p=0.002$ ), peripheral neuropathy ( $p=0.002$ ), current foot ulcer ( $p=0.022$ ), heart failure ( $p=0.022$ ) and self-reported cognitive problems ( $p<0.001$ ).

### IV. DISCUSSION

The mean age of 73 years ( $SD \pm 6.4$ ) in the present study is in line with the age group most affected by type 2 diabetes as it is a chronic disease that lasts for many years (Santos et al., 2015)

The higher prevalence of diabetes in women (56.5%) agrees with the findings of Bauduceau et al. (2014) and Doucet et al. (2012). However, it cannot be said that diabetes affects more women than men, but rather there is a greater search for health services among women (Diabetes Federation International, 2019). It is known that women seek health services more often than men, which can explain such difference (Levorato et al., 2014).

In the present study, the prevalence of functional dependence was higher among older adults aged 75+ and those who were illiterate and earned up to 2 MW compared with older adults under 75 years of age and those who were highly educated and earned more than 2 MW. Researchers have shown that people with low levels of income and education and with poor access to health services are more likely to develop diabetes mellitus (Schmitz et al., 2009).

In our study, most of the older adults ( $n=181$ , 72.9%) were dependent in at least one ADL, whereas in the study by Doucet et al. (2012) 73% of the patients were independent in all ADL. This difference may be related to a higher prevalence of diabetes in Brazil and the greater prevention and control of the disease among the French, which is directly related to their functional capacity and autonomy.

As in the study by Alves, Leite and Machado (2008), older adults' self-rated health was also associated with higher prevalence of dependence, that is, the older adults who rated their health as "poor" were more dependent in activities of daily living ( $p < 0.042$ ) compared with their peers who rated their health as fair and/or very good. This finding demonstrates a relationship between a negative self-perception of health and an increase in dependencies, as pointed out in another study (Confortin et al., 2015).

The greater difficulty in carrying out basic activities of daily living can lead to functional disability and consequently affect the quality of life of the elderly. Bearing in mind that the increase in dependence on basic activities surely interferes in social life by preventing the elderly from visiting friends, attending church and, consequently, compromising the way in which the elderly perceive their own health (Huntley et al., 2012; A. P. Ribeiro et al., 2008; J. L. F. Santos et al., 2008).

The absence of a relationship between dyslipidemia and functional capacity to perform ADL in our study is corroborated by Rodrigues et al. (2008) who found that although older adults with dyslipidemia had less functional capacity, such relationship was not significant. Similarly, Ribeiro et al. (2016) found a lower prevalence of physical inactivity in older adults with dyslipidemia.

Despite the high prevalence of systemic arterial hypertension (SAH) among older adults with diabetes, no association between dependence in ADL and SAH was found in the patients analyzed in the present study. However, an important relationship has been reported in another study (Guedes et al., 2013).

In our study, foot ulcer ( $n=25$ ; 10.2%) and amputations ( $n=15$ ; 6.2%) did not significantly interfere with ADL. This finding can be explained by the fact that most older adults in our study had only minor amputations, such as amputations of fingers. The participants did not present with amputations of a whole limb, like legs.

Patients with foot ulcers have less energy and are less willing to carry out their daily activities (Souza et al., 2013). Accordingly, Goodridge, Trepman and Embil (2005) had previously reported that foot ulcers in diabetic patients negatively affect quality of life, especially because they affect mobility and hence decrease their autonomy and ability to come and go as they wish.

As for amputations, the functional capacity to perform activities of daily living is believed to decline according to the time elapsed after amputation (Vogel et al., 2014). However, this parameter was not assessed in our study. Ashraf et al. (2012) found that amputation increases the prevalence of functional disability, especially for

transferring. However, Mac Neill et al. (2008) found that most bilateral amputees who used prostheses on a regular basis remained independent in ADL.

The statistically significant difference ( $p=0.002$ ) between diabetic older adults with cognitive disorders and their peers without cognitive problems in relation to the ability to perform ADL is corroborated by other researchers who found that cognitive problems, particularly immediate verbal communication problems, interfere with the ability to perform ADL (Mograbi et al., 2014). Other problems that may be related to functional disability are memory decline and verbal fluency decline. Yaffe et al. (2013) conducted a prospective analysis of the association between hypoglycemia and dementia in a cohort of older adults with diabetes and found during follow-up that 18.9% of them had developed dementia. The researchers concluded that there is a bidirectional association between hypoglycemia and dementia in older adults with diabetes.

Functional capacity is notoriously critical for individuals to preserve their independence and social relationships throughout life. Large international studies have shown the harms diabetes can cause to older adults, especially in IADL. IADL are more complex and require greater integrity of the most diverse human organ systems for their execution, especially the musculoskeletal and nervous systems (Ramos et al., 2017; Rekeneire & Volpato, 2015).

In the present study, the highest prevalence rates of dependence in IADL were found among diabetic older adults aged 75+ and those with complete secondary education, income below two minimum wages, previous history of stroke, current peripheral neuropathy, heart failure and self-reported cognitive problems. These findings are strongly correlated with data found in Brazilian and international studies (Barbosa et al., 2014; Brigola et al., 2019; Chen & Hu, 2018; Matos et al., 2018; Nurrika et al., 2019).

An epidemiological study carried out in Minas Gerais and Bahia showed a statistically significant association between chronological aging and functional disability. As time passes, the integrity of the organic systems becomes more susceptible to damage caused by several diseases. Such susceptibility is more pronounced in people with chronic diseases as these diseases can have a negative impact on several functions of the body with irreversible consequences. Diabetes, for instance, leads to micro and macrovascular complications over the course of the disease and depending on glycemic control it can lead to unfavorable clinical outcomes that affect older adults' independence (Barbosa et al., 2014; Matos et al., 2018).



Low levels of education are reportedly an important risk factor for functional independence. However, the mechanisms that seek to elucidate the correlation between these variables are not yet well understood by researchers (Brigola et al., 2019; Chen & Hu, 2018; Nurrika et al., 2019). According to Aguiar et al. (2019), education proved to be a means for individuals to become aware of the most diverse risk factors for diseases and unhealthy working conditions, which could lead to less exposure to situations that could predispose people to diseases in the future and which may lead to an imbalance in the various organic systems as they age. Furthermore, education has proved to be a positive factor for strengthening psychosocial and behavioral aspects (Pereira et al., 2017).

A recent cohort study conducted in Brazil found no statistically significant association between income and disability in IADL, but the association between income and disability in ADL was significant. The researchers argued that in IADL people will directly depend on the environment in which they are inserted, that is, their interaction outside the home will depend on what is offered in the environment, such as quality sidewalks, accessibility in public places, green areas and leisure areas, among others (Danielewicz et al., 2019). These findings are similar to those found in other studies (Aguiar et al., 2019; Ramos et al., 2017). On the other hand, a Canadian study found an association between household income and prevalence of older adults with impaired functional capacity, but the pathway by which these variables correlate requires further research (Philibert et al., 2013).

More than a quarter of the diabetic older adults interviewed (26.5%) were dependent in IADL and rated their health as worse compared with the that in the previous year while the participants who presented with preserved functional capacity considered their health was the same as that in the previous year (39.5%). With regard the older adults who self-rated their health as poor, they have done so due to the negative impact the disease has on the subjective assessment of health in terms of quality of life. When older adults lose their independence to interact with the environment, they tend to have a more negative view about their health status (Latham & Peek, 2013; Ramos et al., 2017; Virtuoso Júnior et al., 2016). Furthermore, people tend to experience multimorbidities as they age and hence lose the ability to rate their health as better and are unable to see their health improved over time despite clinical and laboratory control, as it might have been the case of the older adults who rated their health as the same.

As for the variables related to health conditions, functional capacity is strongly associated with cardiovascular events, cerebrovascular disease (Bauduceau et al., 2014) and

peripheral neuropathy (Le Floch et al., 2014). Peripheral neuropathy predisposes diabetic older adults to injuries to the limbs, especially the feet, and the formation of chronic ulcers which tend to have a poor healing process due to vascular damage resulting from metabolic disease. All that will have an impact on people's functionality and quality of life (Almeida et al., 2013; AlSadrah, 2019; Boulton et al., 2018; Souza et al., 2013). This was also found in the present study, in which 40% of older adults with foot ulcers exhibited impairment in IADL, with a significant association between these variables.

In our study, heart failure impaired functional capacity in many participants (34.4%). Heart failure usually leads to the development of cardiopulmonary symptoms that limit the performance of daily activities independently (Barbosa et al., 2014; Butrous & Hummel, 2016; Pirmohamed et al., 2016).

In addition, national and international studies have found high prevalence rates of functional disability in diabetic older adults after a cerebrovascular event (Carmo et al., 2016; Dutra et al., 2017). This relationship is explained by the vascular damage caused by diabetes itself and other lifestyle factors which, when combined, predispose older adults to higher levels of systemic inflammation and damages to the integrity of the various organs, thereby compromising functional capacity (Rekeneire & Volpato, 2015).

A French longitudinal study assessed functional impairment in diabetic older adults using geriatric scales and found that glycated hemoglobin levels were associated with major neurocognitive disorder and diabetes complications and that there were multifactorial pathophysiological mechanisms linking such conditions, such as metabolic dysregulation, inflammation and chronic vascular damage. However, the mechanisms by which such associations occur need further research as psychiatric disorders, such as depressive disorder, can either occur in the early stages of dementia or even mimic it (Bauduceau et al., 2014; Rekeneire & Volpato, 2015; Verny et al., 2015).

The present study has some limitations. One of them is the use of the Lawton & Brody scale, which despite being widely used in the local environment can be influenced by culture and gender and needs to have certain questions adapted to each environment. Another limitation is related to the Katz scale, as it does not assess walking. Although our study was carried out in a large reference center for patients with diabetes, its results cannot be extrapolated to the entire older population. However, our findings may

contribute to the analysis of other populations and the development of further research.

## V. TABLES

Table 1. Association of sociodemographic and behavioral variables with functional capacity to perform ADL. Fortaleza, Ceará, Brazil.

Variables	Dependence (n = 32)		Independence (n = 216)		PR (95%CI)	p value
	N	%	N	%		
<b>Age</b>						<b>0.002<sup>1</sup></b>
65-74	13	8.0	149	92.0	1	
75+	19	22.1	67	77.9	2.75 (1.43 - 5.3)	
<b>Gender</b>						0.980 <sup>1</sup>
Men	14	13	94	87	1.01 (0.53 - 1.93)	
Women	18	12.9	122	87.1	1	
<b>Marital Status</b>						0.609 <sup>2</sup>
Single	1	7.7	12	92.3	1	
Married	21	14.8	121	85.2	1.92 (0.28 -13.17)	
Divorced/widowed	9	10.2	79	89.8	1.33 (0.18 - 9.65)	
<b>Education</b>						<b>0.010<sup>2</sup></b>
Illiterate	9	25.7	26	74.3	6.69 (1.54 -29.11)	
Secondary education	21	13	140	87	3.39 (0.82 -13.98)	
Higher education	2	3.8	50	96.2	1	
<b>Income</b>						0.166 <sup>1</sup>
Up to 2 wages	27	14.1	165	85.9	2.16 (0.68 - 6.8)	
More than 2 wages	3	6.5	43	93.5	1	
<b>Smoking</b>						0.485 <sup>2</sup>
Yes	1	5	19	95	0.37 (0.05 - 2.55)	
No	31	13.6	197	86.4	1	
<b>Drinking</b>						0.776 <sup>2</sup>
Yes	3	9.7	28	90.3	0.72 (0.23 - 2.24)	
No	29	13.4	188	86.6	1	
<b>Diet</b>						0.825 <sup>1</sup>
Yes	21	12.3	150	87.7	1.09 (0.51 - 2.34)	
No	8	11.3	63	88.7	1	
<b>Use of oral diabetes drugs</b>						0.178 <sup>1</sup>
Yes	23	11.5	177	88.5	0.61 (0.3 - 1.24)	
No	9	18.8	39	81.3	1	
<b>Use of insulin</b>						0.750 <sup>1</sup>
Yes	18	13.5	115	86.5	1.11 (0.58 - 2.13)	

Variables	Dependence (n = 32)		Independence (n = 216)		PR (95%CI)	p value
	N	%	N	%		
No	14	12.2	101	87.8	1	

Note. Source: Own elaboration; <sup>1</sup> Chi-squared test; <sup>2</sup> Fisher's Exact Test

Table 2. Association of clinical characteristics with functional capacity to perform ADL. Fortaleza, Ceará, Brazil.

Variables	Dependence (n = 32)		Independence (n = 216)		PR (95%CI)	p value
	N	%	N	%		
<b>Self-rated health</b>						<b>0.002<sup>2</sup></b>
Very good	0	0	25	100	-	
Fair	16	9.9	145	90.1	1	
Poor	15	24.6	46	75.4	2.47 (1.3 - 4.69)	
<b>Current health compared with that in the previous year</b>						<b>0.038<sup>1</sup></b>
Better	10	16.1	52	83.9	3.27 (1.07 - 9.92)	
The same	4	4.9	77	95.1	1	
Worse	17	16.7	85	83.3	3.38 (1.18 - 9.64)	
<b>Dyslipidemia</b>						0.193 <sup>1</sup>
Yes	21	13.2	138	86.8	1.82 (0.72 - 4.64)	
No	5	7.2	64	92.8	1	
<b>Hypertension</b>						0.421 <sup>2</sup>
Yes	25	12	184	88	0.72 (0.32 - 1.63)	
No	6	16.7	30	83.3	1	
<b>Stroke</b>						<b>0.036<sup>2</sup></b>
Yes	8	25.8	23	74.2	2.42 (1.19 - 4.93)	
No	23	10.6	193	89.4	1	
<b>Hypoglycemia within 6 months prior to the consultation</b>						0.785 <sup>1</sup>
Yes	6	11.5	46	88.5	0.89 (0.39 - 2.06)	
No	25	13	168	87	1	
<b>Infectious episodes within 6 months prior to the consultation</b>						0.228 <sup>1</sup>
Yes	8	18.2	36	81.8	1.58 (0.76 - 3.3)	
No	23	11.5	177	88.5	1	
<b>Peripheral Neuropathy</b>						0.052 <sup>1</sup>
Yes	14	14.9	80	85.1	2.15 (0.97 - 4.76)	
No	9	6.9	121	93.1	1	
<b>Foot ulcer (current)</b>						0.335 <sup>2</sup>
Yes	5	20	20	80	1.69 (0.71 - 4.01)	
No	26	11.8	194	88.2	1	

Variables	Dependence (n = 32)		Independence (n = 216)		PR (95%CI)	p value
	N	%	N	%		
<b>Amputation</b>						0.408 <sup>2</sup>
Yes	3	20	12	80	1.69 (0.58 - 4.94)	
No	27	11.8	201	88.2	1	
<b>Coronary insufficiency</b>						0.938 <sup>1</sup>
Yes	9	12	66	88	0.97 (0.47 - 2.02)	
No	21	12.4	149	87.6	1	
<b>Heart failure</b>						0.077 <sup>2</sup>
Yes	7	21.9	25	78.1	2.11 (0.98 - 4.53)	
No	22	10.4	190	89.6	1	
<b>Self-reported cognitive disorders</b>						<0.001 <sup>1</sup>
Yes	14	29.8	33	70.2	4.15 (2.13 - 8.1)	
No	14	7.2	181	92.8	1	
<b>BMI</b>						0.039 <sup>2</sup>
Underweight	3	17.6	14	82.4	2.42 (0.75 - 7.84)	
Normal weight	13	17.3	62	82.7	2.38 (1.12 - 5.06)	
Obesity	11	7.3	140	92.7	1	

Note. Source: Own elaboration; <sup>1</sup> Chi-squared test; <sup>2</sup> Fisher's Exact test

Table 3. Association of sociodemographic and behavioral variables with functional capacity to perform IADL. Fortaleza, Ceará, Brazil.

Variables	Dependence (n = 47)		Partial Dependence (n = 128)		Independence (n = 73)		p value
	N	%	N	%	N	%	
<b>Age</b>							<0.001 <sup>1</sup>
65-74	17	10.5	86	53.1	59	36.4	
75+	30	34.9	42	48.8	14	16.3	
<b>Gender</b>							0.177 <sup>1</sup>
Men	15	13.9	61	56.5	32	29.6	
Women	32	22.9	67	47.9	41	29.3	
<b>Marital Status</b>							0.057 <sup>2</sup>
Single	1	7.7	6	46.2	6	46.2	
Married	23	16.2	83	58.5	36	25.4	
Divorced/widowed	22	25	36	40.9	30	34.1	
<b>Education</b>							<0.001 <sup>1</sup>
Illiterate	9	25.7	20	57.1	6	17.1	
Secondary education	36	22.4	86	53.4	39	24.2	



Variables	Dependence (n = 47)		Partial Dependence (n = 128)		Independence (n = 73)		p value
	N	%	N	%	N	%	
Higher education	2	3.8	22	42.3	28	53.8	<b>0.011<sup>1</sup></b>
<b>Income</b>							
Upt o 2 wages	37	19.3	106	55.2	49	25.5	
More than 2 wages	5	10.9	19	41.3	22	47.8	<b>0.671<sup>2</sup></b>
<b>Smoking</b>							
Yes	4	20	12	60	4	20	
No	43	18.9	116	50.9	69	30.3	<b>0.514<sup>1</sup></b>
<b>Drinking</b>							
Yes	7	22.6	13	41.9	11	35.5	
No	40	18.4	115	53	62	28.6	<b>0.678<sup>1</sup></b>
<b>Diet</b>							
Yes	32	18.7	86	50.3	53	31	
No	11	15.5	40	56.3	20	28.2	<b>0.157<sup>1</sup></b>
<b>Use of oral diabetes drugs</b>							
Yes	35	17.5	101	50.5	64	32	
No	12	25	27	56.3	9	18.8	<b>0.531<sup>1</sup></b>
<b>Use of insulin</b>							
Yes	23	17.3	73	54.9	37	27.8	
No	24	20.9	55	47.8	36	31.3	

Note. Source: Own elaboration; Chi-squared test<sup>1</sup>; Fisher's Exact test<sup>2</sup>

Table 4. Association of clinical variables with functional capacity to perform IADL in older adults. Fortaleza, Ceará, Brazil.

Variables	Dependence (n = 47)		Partial Dependence (n = 128)		Independence (n = 73)		p value
	N	%	N	%	N	%	
<b>Self-rated health</b>							<b>0,066<sup>2</sup></b>
Very good	2	8	13	52	10	40	<b>0,019<sup>1</sup></b>
Fair	27	16,8	82	50,9	52	32,3	
Poor	17	27,9	33	54,1	11	18	
<b>Current health compared with that in the previous year</b>							<b>0,976<sup>1</sup></b>
Better	10	16,1	38	61,3	14	22,6	
The same	9	11,1	40	49,4	32	39,5	
Worse	27	26,5	49	48	26	25,5	<b>0,976<sup>1</sup></b>
<b>Dyslipidemia</b>							
Yes	27	17	83	52,2	49	30,8	
No	11	15.9	36	52.2	22	31.9	

Variables	Dependence (n = 47)		Partial Dependence (n = 128)		Independence (n = 73)		p value
	N	%	N	%	N	%	
<b>Hypertension</b>							0.527 <sup>1</sup>
Yes	37	17.7	110	52.6	62	29.7	
No	9	25	16	44.4	11	30.6	
<b>Stroke</b>							0.002 <sup>1</sup>
Yes	13	41.9	11	35.5	7	22.6	
No	33	15.3	117	54.2	66	30.6	
<b>Hypoglycemia within 6 months prior to the consultation</b>							0.951 <sup>1</sup>
Yes	9	17.3	27	51.9	16	30.8	
No	37	19.2	99	51.3	57	29.5	
<b>Infectious episodes within 6 months prior to the consultation</b>							0.695 <sup>1</sup>
Yes	10	22.7	21	47.7	13	29.5	
No	35	17.5	106	53	59	29.5	
<b>Peripheral Neuropathy</b>							0.002 <sup>1</sup>
Yes	20	21.3	57	60.6	17	18.1	
No	15	11.5	64	49.2	51	39.2	
<b>Foot ulcer (current)</b>							0.022 <sup>2</sup>
Yes	10	40	9	36	6	24	
No	35	15.9	119	54.1	66	30	
<b>Amputation</b>							0.061 <sup>2</sup>
Yes	2	13.3	12	80	1	6.7	
No	42	18.4	116	50.9	70	30.7	
<b>Coronary insufficiency</b>							0.717 <sup>1</sup>
Yes	13	17.3	37	49.3	25	33.3	
No	33	19.4	89	52.4	48	28.2	
<b>Heart failure</b>							0.022 <sup>1</sup>
Yes	11	34.4	16	50	5	15.6	
No	34	16	110	51.9	68	32.1	
<b>Self-reported cognitive disorders</b>							<0.001 <sup>1</sup>
Yes	24	51.1	21	44.7	2	4.3	
No	20	10.3	105	53.8	70	35.9	
<b>BMI</b>							0.055 <sup>2</sup>
Underweight	7	41.2	7	41.2	3	17.6	
Normal weight	15	20	42	56	18	24	
Obesity	21	13.9	78	51.7	52	34.4	

Note. Source: Own elaboration; Chi-squared test<sup>1</sup>; Fisher's Exact test<sup>2</sup>

## VI. CONCLUSION

We conclude that it is important to work on public policies that reduce social inequalities, as this study demonstrated that socioeconomic differences such as income and education are related to the loss of functional capacity in older adults. Autonomy and functional independence in the household and community should be encouraged in order to achieve healthy and active aging.

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