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Original Article

How our population is aging. Factors associated with the functional capacity of older adults in Bucaramanga-Colombia: The ARENA Study

Como está envejeciendo nuestra población. Factores asociados a la capacidad funcional de adultos mayores en Bucaramanga-Colombia: Estudio ARENA

Como nossa população está envelhecendo. Fatores associados à capacidade funcional de idosos em Bucaramanga-Colômbia: Estudo ARENA

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Author Contributions

HABC. initiated the study and was responsible for its overall design. MOCS. is an expert in Geriatrics field, supporting the instrument's choice and the art review. HABC and SSG critically discussed the design of the document. SSG and HABC. implemented the data analysis; SSG. performed the statistical and probabilistic study. HABC and MOCS. implemented the writing of the manuscript.

ABSTRACT

Introduction. As a demographic aging result, societies have experienced effects such as the increase of functional limitations in older adults and high demand for social and health care. The objective is to analyze factors associated with the functional level of daily life activities and socio-family risk factors of older adults in an urban population in Bucaramanga-Colombia. **Methodology.** Analytical cross-sectional secondary data study. 196 older adults were studied after excluding individuals with incomplete records. The Barthel and the Lawton Index were used for functional status, and Socio-Family Assessment Scale for social risk. The STATA software was used for doing the logistic regression that helped to determine association between variables. **Results.** Above half of older adults presented functional limitations when performing daily life activities (59.69%). The prevalence of a socio-family risk was 47.45%. Functional limitation was associated with age, cognitive dysfunction and falls risk. **Discussion.** The study demonstrated lower scores in the Barthel Index and high scores in risk and social problematic situations compared to other studies. Moreover, results support that high blood pressure is a risk factor for functional limitations situations. **Conclusion.** It is important to continue interventions about health status in older people to identify risk factors, such as cognitive dysfunction, high Falls risk and chronic diseases control.

Keywords:

Aged; Functional Status; Activities of Daily Living; Social Factors; Geriatrics

RESUMEN

Introducción. Como consecuencia del envejecimiento demográfico las sociedades han experimentado efectos tales como, el aumento de adultos mayores con limitaciones funcionales y la alta demanda de atención socio sanitaria. El objetivo es analizar los factores asociados al nivel funcional para las actividades de la vida diaria y los factores de riesgo sociofamiliares de los adultos mayores en una población urbana de Bucaramanga, Santander-Colombia. **Método.** Estudio transversal analítico de datos secundarios, se estudiaron 196 adultos mayores después de excluir a los individuos con registros incompletos. Se utilizó el Índice de Barthel y Lawton para evaluar el estado funcional y la Escala de Evaluación Sociofamiliar para el riesgo social. Se utilizó el software STATA para realizar la regresión logística que ayudó a determinar la asociación entre variables. **Resultados.** Más de la mitad de los adultos mayores presentaron limitaciones funcionales para realizar actividades de la vida diaria (59.69%). La prevalencia de riesgo sociofamiliar fue 47.45%. La limitación funcional se asoció con la edad, la disfunción cognitiva y el riesgo de caídas. **Discusión.** El estudio demostró puntajes bajos en el Índice de Barthel y puntajes altos en situaciones de riesgo y problemática social en comparación con otros estudios. Además, los resultados apoyan a la hipertensión arterial como un factor de riesgo para el deterioro funcional. **Conclusión.** Es importante continuar con intervenciones sobre la salud de los adultos mayores con el fin de identificar factores de riesgo, como la disfunción cognitiva, el riesgo de caídas y el control de enfermedades crónicas.

Palabras clave:

Anciano; Estado Funcional; Actividades Cotidianas; Factores Sociales; Geriatria

RESUMO

Introdução. Como consequência do envelhecimento demográfico, as sociedades têm experimentado efeitos como o aumento de idosos com limitações funcionais e elevada procura de atendimento sócio-sanitário. O objetivo é analisar os fatores associados ao nível funcional para atividades de vida diária e os fatores de risco sociofamiliares de idosos em uma população urbana de Bucaramanga, Santander-Colômbia. **Método.** Estudo transversal analítico de dados secundários, foram estudados 196 idosos após exclusão dos indivíduos com prontuários incompletos. Foi utilizado o Índice de Barthel e Lawton para avaliar o estado funcional e a Escala de Avaliação Sociofamiliar para risco social. O software STATA foi utilizado para realizar a regressão logística que ajudou a determinar a associação entre as variáveis. **Resultados.** Mais da metade dos idosos apresentou limitações funcionais na realização das atividades de vida diária (59.69%). A prevalência de risco sociofamiliar foi de 47.45%. A limitação funcional foi associada à idade, à disfunção cognitiva e ao risco de queda. **Discussão.** O estudo demonstrou pontuações baixas no Índice de Barthel e pontuações altas em situações de risco e problemas sociais em comparação com outros estudos. Além

disso, os resultados apoiam a hipertensão arterial como fator de risco para deterioração funcional. **Conclusão.** É importante dar continuidade às intervenções sobre a saúde dos idosos, a fim de identificar fatores de risco, como disfunção cognitiva, risco de quedas e controle de doenças crônicas.

Palavras-chave:

Idoso; Estado Funcional; Atividades Cotidianas; Fatores Sociais; Geriatria.

Introduction

The number of people over 60 has recently increased worldwide, producing the demographic aging phenomenon. An example is the increase in the number of older adults in Latin America and the Caribbean. According to the “Age Carefully” report of the World Health Organization (WHO), several countries in the region will experience this phenomenon (1). In Colombia and South America, the proportion of older adults is 13.3%, and population projections indicate an increase of 23% by 2050 (2).

As a result of demographic aging, societies will experience two related effects: firstly, the proportion of people aged 80 and over will increase. And, secondly, the increment in older adults with functional limitations and the high social and health care demand by those responsible for caring for them.

Currently, the morbidity burden of the Colombian older population is represented by chronic non-communicable diseases (NCDs) such as hypertension, a risk factor that translates into an increase in cardiovascular complications generating functional limitations and disability. Hessel et al. (3), have shown the negative relationship between demographic and health factors at the functional level because these determinants affect people’s interaction with the environment and its path.

Variables such as gender and economic dependence are significantly associated. Positive family functioning has been linked to increased opportunities, resources, social support, and good mental health in later life (4,5).

In addition, Colombia is a country with inequalities and inequities impacting older adults that perpetuate vulnerable situations (6). Hence, the national government has generated public policies and instruments to solve the population’s social needs as it ages. However, policies require more intersectoral work based on relationships that contribute to achieving objectives aimed at promoting healthy aging.

Organism aging generally refers to the process in which cells age and stop dividing (not dying) permanently; this is known as senescence. According to what is known, although all living beings age, human aging is a multidimensional complex process characterized by being heterogeneous, intrinsic, and irreversible; it is developed in relation to life events and decision-making, related to life changes according to the perception actions and social features of the person (7,8).

Consequently, old age is a constructed stage of life influenced by gender, life events, transitions, and social interactions. It involves developmental processes, limitations, and the experience of both positive and negative changes (9).

ADLs (Activities of Daily Living) concept describes self-care skills where physiological, cognitive, and sensory abilities are basic elements in their execution. They serve as indicators of functional status, as the inability to perform ADLs can result in functional limitation, a prevalent condition among older adults. Additionally, functional limitations can worsen health risks, diminish quality of life, and predict admission to nursing homes and care centers (10).

This study applies the Disability Process Model (DPM) as a foundational theoretical framework for gerontological and public health research (11). The DPM explains how chronic and acute conditions affect biological functioning and ADLs, as well as the interpersonal relationships and environmental factors that influence functional limitation.

By incorporating the DPM constructs, the original model’s concepts are embraced. Functional limitation refers to the inability to perform physical and mental tasks compared to same-age and same-gender individuals. It correlates sociodemographic characteristics and health status at individual and socioeconomic levels as explanatory variables with functional levels in ADL performance (12). The instrumental level involves skills for autonomous living and interaction among older adults, families, and the community.

The interaction of these factors influences intrinsic capacity, leading to favorable conditions for independent and healthy living or an increased risk of disease burden and functional limitations (13). Consequently, functional capacity is crucial in gerontological and geriatric evaluations as it provides valuable information about older adults’ health status and care needs in clinical and community settings (14).

Social factors are interaction elements that can affect individuals’ well-being and the onset of chronic diseases (3). The complex social situations of older adults involve various interrelated factors such as sociodemographics, economics, and health, which can unexpectedly contribute to abuse and vulnerability situations (15).

Sectors of society, therefore, must take responsibility for the challenges of demographic aging and assess how populations

age, along with the implications that affect health systems, particularly regarding functional ability (16).

The study uses data from the gerontological nursing assessment database of an adult care day center in Bucaramanga-Colombia. This database includes projects, protocols, infrastructure, and administrative components for comprehensive daycare services for socially vulnerable older individuals. The study analyzes factors linked to functional levels in ADLs and socio-family risks among older adults. It follows quantitative research guidelines for assessing functional capacity in community-dwelling older adults. Demographic and health status factors are expected to correlate with ADL and IADL (Instrumental Activities of Daily Living) functional limitation, along with social-family risk situations.

Methodology

Study Design and Sample

The ARENA study (Adulto-mayoR-Evaluaci3n-Actividades) is an analytical cross-sectional study of secondary data. The information was obtained from the gerontological nursing assessment database of an adult care day center, which collects information about the health status and risk stratification of older adults who reside in the urban community of Bucaramanga-Colombia.

The gerontological evaluation used as a reference has been carried out since 2019 and is based on primary sampling units set by communes, which are subdivisions of neighborhoods.

The sample calculation compared averages with a 95% confidence level ($\alpha < 0.05$) and 80% power ($\beta = 0.8$). The selected variable for this calculation was the ADLs functionality score. The sample consisted of 196 older adults who met the inclusion criteria of having a complete record in the database between 2019-2020. The exclusion criteria were residing outside Bucaramanga.

This research was approved with code CIEI-UNAB-003-2021 by the Research Ethics Committee of the Universidad Aut3noma de Bucaramanga. The study adopted guidelines to enhance the transparency and quality of health research reports and The Declaration of Helsinki principles.

Measurements

Activities of Daily Living (ADLs):

Corresponding with the DPM and the research recommendations (11), the Barthel Index score was considered to determine the functionality to perform ten ADLs, obtaining a quantitative estimate of their independence degree (14,17). The primary activities such as eating, moving, personal hygiene, bathroom use, bathing,

movement, going up and down stairs, dressing, and toilet training are valued in an ordinal categorical way, being able to assign 0.5, 10, or 15 points.

Instrumental Activities of Daily Living (IADLs):

For the evaluation of IADLs, this study is based on the Lawton Index, which helps to detect the first signs of functional limitation in older adults living in the community, allowing monitoring of care dependency risk (17). It evaluates instrumental activities such as using the phone, cooking, doing laundry, doing housework, using transportation, handling money, shopping, and taking medicine are valued from 1 to 0 points. The total score allows to identify situations of total independence (score 8) or levels of functional limitation (score <8).

Socio-Family Evaluation:

The evaluation of this dimension uses the score of the Socio-Family Assessment Gijon's Scale, which allows for the detection of risk and problematic social situations (18). A score is assigned using a Likert scale for each area (family situation, economic situation, housing, relationships, and social support) from 1 to 5 points, allowing global categorization of the socio-family situation as good (from 5 to 9), with risk (from 10 to 14) and social problems (score ≥ 15). The risk guides the lack of help, social and physical deteriorating resources, and economic and social vulnerability.

Control Variables

Two sets of variables were included in the analysis. Firstly, demographic variables such as age were configured by groups and gender and social status. Secondly, the health status variables were defined under intermediary determinants of healthy aging, which correlate with a good performance of the ADLs, inferring that promoting and maintaining these capacities can improve functionality and prevent disability (6).

Eight variables were selected to reflect the health status: Pathological history, polypharmacy (consumption of 5 medications or more), Body Mass Index (BMI) according to ESPEN practical guideline (19), assessment of cognitive status through the Mini-Cog instrument, and the level of falls risk measured with Test Timed Up and Go (20). Physiological include predictive variables of cardiovascular disease, such as systolic blood pressure, diastolic blood pressure, and heart rate.

Statistical Analysis

A univariate descriptive analysis was performed using the mean and standard deviation for quantitative variables and relative and absolute frequencies for qualitative variables with their respective 95% confidence intervals (CI 95%). To achieve the objective, the dependent variables results were dichotomized by ADLs level: a) Barthel Index (=100 points

independent and <100 points some degree of functional limitation), b) IADLs Lawton Index (=8 points independent and <8 points some degree of limitation), and c) socio-family assessment (<9 points indicate an excellent socio-family situation and >9 points some social problems).

Then, with the dependent variables dichotomized, bivariate logistic regressions were carried out, which allowed the evaluation of the association between the independent variables and functional capacity. A value of $p < 0.05$ was considered significant for all inferential statistical tests. The crude Odds Ratio (OR) was estimated in the statistical analysis with CI 95%. The data was analyzed using the software STATA© Version 15.1 for Windows.

Results

Summary descriptive statistics are presented in Table 1. The average age was 72.91 years ($SD \pm 7.88$). Of the 196 participants, 58.16% were women, and 41.84% were men; all belonged to the lowest socioeconomic stratum (less than base income). Regarding their state of health, 65.31% have between 1-2 pathological antecedents; the most frequent is High Blood Pressure (HBP) (42.35%; CI 95%: 35.56-49.43), hyperlipidemia (26.53%; CI 95%: 20.77-33.21) and the non-insulin dependent Diabetes Mellitus (15.82%; CI 95%: 11.31-21.67).

Table 1. Demographic characteristics and health status.

Sociodemographic Variables		Total n=196 (%)	CI 95%
Gender	Woman	114 (58.16%)	(51.07-64.92)
	Man	82 (41.84%)	(35.07-48.92)
Age-(Years)	≤67	54 (27.55%)	(21.70-34.28)
	>67-≤72	50 (25.51%)	(19.85-32.13)
	>72-≤79	48 (24.49%)	(18.93-31.05)
	≥80	44 (22.45%)	(17.10-28.88)
Socioeconomic Status	Status 1	147 (75%)	(68.40-80.60)
	Status 2	49 (25%)	(19.39-31.59)
Health Variables			
Pathological History	0	52 (26.53%)	(20.77-33.21)
	1-2	128 (65.31%)	(58.31-71.69)
	3-4	16 (8.16%)	(5.03-12.95)
Polypharmacy	yes	103 (52.55%)	(45.49-59.50)
	No	93 (47.45%)	(40.49-54.50)
Systolic Blood Pressure (mmHg)	<130	140 (71.43%)	(64.64 – 77.36)
	≥130	56 (28.57%)	(22.63 – 35.35)
Diastolic Blood Pressure (mmHg)	Range, mean ±SD*	(60-82) 71.42±6.32	-
Heart Rate (per minute)	Range, mean ±SD*	(58-98) 76.53±6.89	-
Body Mass Index (kg/m2)**	Under-weight (<22)	42 (21.43%)	(16.19-27.78)
	Normal-weight (22-26.9)	101 (51.53%)	(44.48-58.51)
	Overweight (27-29.9)	28 (14.29%)	(10.01-19.97)
	Obesity (≥30)	25 (12.75%)	(8.73-18.25)
Cognitive Assessment			
Test Mini-Cog	Likely deterioration (0-2 points)	34 (17.35%)	(12.62-23.35)
	Very unlikely deterioration (3-5 points)	162 (82.65%)	(76.64-87.37)
Fall Risk Assessment			
Test Timed Up and Go	Raised irrigation (>13 seconds)	80 (40.82%)	(34.09-47.89)
	Mild mobility impairment (11-13 seconds)	116 (59.18%)	(52.10-65.90)

Note: *Standard Deviation **Ranges based on practical recommendations from geriatric experts (SEGG) and nutrition (SENPE).

Source: elaborated by authors.

The prevalence of polypharmacy was 52.55% (CI 95%: 45.49-59.50). Regarding their BMI, 14.29% (CI 95%: 10.01-19.97) were recorded as overweight and 12.75% (CI 95%: 8.73-18.25) as obese. Whereas 21.43% (CI 95%: 16.19-27.78) of older adults had a BMI <22 kg/m², indicating low weight.

Cognitive assessment data suggest that 17.35% (CI 95%: 12.62-23.35) of individuals have probable cognitive

impairment. In addition, all older adults had some level of fall risk with 40.82% (CI 95%: 34.09-47.89).

It is identified that 59.69% (CI 95%: 52.61-66.38) have some degree of functional limitation to perform ADLs, while 44.90% (CI 95%: 38.01-51.97) have instrumental functional limitation. In addition, there is evidence of a prevalence of 47.45% (CI 95%: 40.49-54.50) of socio-family risk situations. Notably, 29.59% (CI 95%: 23.57-36.41) of older adults have socio-family problems (Table 2).

Table 2. Prevalence of Socio-family risk

	Total n=196(%)	CI 95%
Socio-family evaluation-Gijon 's Scale*		
Good situation	45 (22.96%)	(17.56-29.42)
Risk	93 (47.45%)	(40.49-54.50)
Social problems	58 (29.59%)	(23.57-36.41)

Source: elaborated by authors.

Table 3 presents the results of the logistic regression. The analysis shows that belonging to the lowest socioeconomic status (strata-1) is associated with a higher or highest risk of functional limitation of the ADLs (OR 1.45; CI 95%: 1.04-2.01) and presents socio-family risk situations (OR 3.32; CI 95%: 2.26-4.87).

Compared to men, women had a significantly higher risk of having functional limitations for ADLs (OR 1.92; CI 95%: 1.30-2.83). Moreover, the possibility of suffering socio-family risk situations increases 3.5 times for women (OR 3.56; CI 95%: 2.28-5.54).

The results suggest an association between age and limitation functional for ADLs, IADLs, and socio-family risk, being higher for the age group ≥80 years (OR 6.54; CI 95%: 2.55-16.73), (OR 4.39; CI 95%: 1.86-10.33), (OR 3.63; CI 95%: 1.37-9.61), respectively.

About polypharmacy, the consumption of 5 medications or more was associated with a higher risk of functional limitation for ADLs (OR 1.90; CI 95%: 1.06-3.39) and presenting socio-family risk (OR 3.63, CI 95%: 1.76-7.47), compared to those who consume fewer medications. On the other hand, having a BMI <22 kg/m² is associated with lower socio-family functionality (OR 4.25; CI 95%: 1.96-9.18) compared to having a normal BMI.

Probable cognitive impairment and high fall risk are associated with an increased limitation to perform ADLs and IADLs, in addition, to present socio-family risk situations. For example, probable cognitive impairment increases the probability of functional limitation in IADLs 2.6 times (OR 2.66; CI 95%: 1.23-5.75) and raises 3.6

times the probability of socio-family risk situations (OR 3.61; CI 95%: 1.05-12.44), compared to older independent adults.

Falls risk increases 5.3 times the probability of lower functional capacity for ADLs (OR 5.33; CI 95%: 2.72-10.42) and raises 5.5 times the probability of functional limitation for IADLs (OR 5.53; CI 95%: 2.97-10.30), regarding older adults with mild mobility disability.

The results of the categorical logistic regression showed that a presenting diagnosis of HBP is associated with more significant functional limitation for ADLs (OR 2.56; CI 95%: 1.39-4.69), further functional limitation for IADLs (OR 1.92; CI 95%: 1.08-3.42) and presenting socio-family risk (OR 2.44; CI 95%: 1.17- 5.08).

Discussion

The sample includes adults in early old age (60-79 years) and old age (80-95 years). Over half of older adults experienced limitations in ADLs compared to IADLs. These findings differ from reports in Colombia (6) and Spain (17), where instrumental deterioration prevails at a community level. However, the prevalence of functional limitations is similar at this level.

Due to the disagreement between studies, it is essential to note that the physical environment could influence these results because the study was developed only with older adults living in urban areas with low socioeconomic status, a context prone to establishing more significant functional limitations (6).

Table 3. Logistic regression model for the association between sociodemographic characteristics and health status with functional impairment (n=196).

Sociodemographic Variables		Functional Impairment ADLs OR (CI 95%)*	p	Functional Impairment IADLs OR (CI 95%)*	p	Social-Family Risk Situation OR (CI 95%)*	p
Gender	Man	Reference		Reference		Reference	
	Woman	1.92(1.30-2.83)	0.001 α	0.96(0.66-1.39)	0.851	3.56(2.28-5.54)	<0.001 α
Age (Years)	≤67	Reference		Reference		Reference	
	>67-≤72	1.34(0.61-2.91)	0.457	0.58(0.24-1.36)	0.215	3.13(1.26-7.72)	0.013 α
	>72-≤79	3.91(1.69-9.04)	0.001 α	2.17(0.98-4.82)	0.056	4.0(1.52-10.60)	0.005 α
	≥80	6.54(2.55-16.73)	<0.001 α	4.39(1.86-10.33)	0.001 α	3.63(1.37-9.61)	0.009 α
Socioeconomic Stratum	Stratum 1	1.45(1.04-2.01)	0.027 α	1.54(0.80-2.96)	0.186	3.32(2.26-4.87)	<0.001 α
	Stratum 2	Reference		Reference		Reference	
Health Variables							
Pathological History	0	Reference		Reference		Reference	
	1-2	1.86(0.96-3.57)	0.062	1.58(0.81-3.06)	0.175	1.44(0.69-3.00)	0.322
	3-4	2.37(0.72-7.80)	0.154	1.73(0.56-5.38)	0.339	2.83(0.57-14.03)	0.201
Polypharmacy	Yes	1.90(1.06-3.39)	0.029 α	1.06(0.60-1.87)	0.828	3.63(1.76-7.47)	<0.001 α
	No	Reference		Reference		Reference	
Systolic Blood Pressure (mmHg)	<130	Reference		Reference		Reference	
	≥130	1.63(0.84-3.13)	0.142	1.14(0.79-2.74)	0.221	1.31(0.61-2.81)	0.486
Diastolic Blood Pressure (mmHg)	71.42±6.32	0.94(0.90-0.99)	0.021 α	1.0(0.96-1.05)	0.661	0.86(0.81-0.91)	<0.001 α
Heart Rate (per minute)	76.53±6.89	1.04(1.00-1.08)	0.042 α	0.96(0.92-1.00)	0.076	1.07(1.02-1.13)	0.003 α
Body Mass Index (kg/m2)	Under-weight	1.21(0.65-2.22)	0.538	1.00(0.54-1.83)	1.000	4.25(1.96-9.18)	<0.001 α
	Normal-weight	Reference		Reference		Reference	
	Overweight	0.61(0.23-1.62)	0.330	0.75(0.28-1.96)	0.558	0.86(0.26-2.82)	0.807
	Obesity	1.46(0.53-4.06)	0.459	0.92(0.34-2.48)	0.874	0.5(0.15-1.56)	0.233
Cognitive Assessment Test Mini-Cog™	Likely deterioration	4.87(1.79-13.23)	0.002 α	2.66(1.23-5.75)	0.013 α	3.61(1.05-12.44)	0.042 α
	Very unlikely deterioration	Reference		Reference		Reference	
Fall Risk Assessment Test Timed Up and Go	Raised irrigation	5.33(2.72-10.42)	<0.001 α	5.53(2.97-10.30)	<0.001 α	2.60(1.22-5.51)	0.013 α
	Mild mobility impairment	Reference		Reference		Reference	

Note: *OR: Odds Ratio; CI: Confidence interval. α p:<0.05 statistically significant association.

Source: elaborated by authors.

Furthermore, keep in mind that the first cause of IADL involvement is cognitive impairment. Evidently, the prevalence in this study was <20%; this helps to explain a lower commitment at the instrumental level (21).

Age is one of the explanatory variables of this outcome when analyzing the intrinsic factors associated with

functional limitations. As age increases, the risk of functional limitation increases both at the basic and instrumental levels, an implication that leads to possible disability situations (22), and it also increases the probability of socio-family risk situations. These results are consistent with aging processes in poverty and social inequity environments.

Huge differences between genders are evident. Being a woman (60-95 years) is reported as a risk factor for obtaining the worse scores on the ADLs and presenting a socio-family risk. This widely studied phenomenon highlights the different biopsychosocial dynamics of women throughout life and how these conditions predispose them to situations of functional limitation (23).

On the other hand, multi-morbidity (complex interaction of several coexisting diseases) did not present a significant association in the factors of health state. However, it is reported that suffering from HBP increases functional limitation and socio-familial risk.

Aging causes changes in the arterial vasculature, which can establish pathologies such as HBP and, consequently, the development of disabling cardiovascular diseases such as heart failure and stroke (24).

Studies have shown that the development of dementia is associated with HBP and vice versa; these results, compared with the national reports (25), position cognitive dysfunction as a risk factor for functional and socio-family limitation (26).

The blood pressure variables in this study are reported in goals according to the objectives proposed for older people (27). The control of diastolic blood pressure is a factor that decreases the probability of functional limitation for ADLs and socio-family risk, surely due to its effect in reducing cardiovascular complications. Diastolic blood pressure between 70 and 99 mmHg has been associated with lower mortality rates, and studies have shown that blood pressure control with antihypertensive drugs has been associated with the preservation of the ability to perform ADLs (28).

Another determinant of cardiovascular study was heart rate, which was associated with an increase in socio-family risk situations. However, this relationship needs to be better understood. Heart rate is known to be determined by intrinsic activity, which decreases with time and produces differences in health status (29). Therefore, more studies are required to guide better decision-making related to the socio-family situation.

The prevalence of polypharmacy is higher than that of national research (30). The results allow to analyze the multi-morbidity and cardiovascular physiological variables reported with a consumption of 5 medications or more, polypharmacy being an intrinsic factor associated with functional limitation and a high fall risk (30).

The most frequently reported nutritional status is normal weight; even though indicators of overweight and obesity are described, these conditions did not show a meaningful association.

The identified prevalence of low weight is higher than that at the national level, in addition to the present association with an increase in the probability of socio-family risk situations (31).

This influence is linked to interrelated factors: first, the impoverished physical environment, which reduces opportunities throughout life to contribute to food insecurity in the older population (32). Second, the decrease in muscle mass reflects a lack of nutrition and adequate physical activity, and third, presenting functional limitation to perform ADLs has been associated with greater demand for care (22).

Colombia has a tradition of social violence that justifies the possibility of risks such as mistreatment and discrimination (5). The results show a high prevalence of socio-familial risk, as evidenced by scarcity of economic resources, one-person family formation, living with a spouse with some degree of care dependency, and a social relationship only with relatives or neighbors.

This study includes a relevant sample of older adults in a condition of social vulnerability in Bucaramanga, evaluated using validated and easy-to-apply instruments that favor the reproducibility of the observations and generate a reference framework for the design of gerontological care management interventions.

Some limitations of this study are inherent to its design because they do not set a causal relationship between variables. In addition, it takes a single moment and does not include time interventions at the physical, nutritional, or psychosocial levels that aim at repercussions at the functional level. However, it is considered that the level of association and the multivariate analysis reliably estimate the association between the variables described.

For future research and gerontological practices, it is important to consider long-term interventions that cover physical, psychosocial, and nutritional aspects of older adults in conditions of social vulnerability, such as physical activity, diet, community participation, and neighborhood characteristics. This will allow a more complete evaluation of healthy aging determinants and develop the functional level impact in older adults.

Conclusions and implications

This study contributes to the knowledge management of factors associated with the functional capacity of older adults in Bucaramanga, Colombia. It aligns with the approach of healthy aging and DPM. The study identifies associations between sociodemographic factors such as age, gender, and socioeconomic status, as well as health status factors such as cognitive dysfunction, low weight, high fall risk, and polypharmacy. Additionally, it highlights the needs related

to community life, such as poverty and limited opportunities, which significantly impact the well-being of older adults.

The study's findings have practical implications for promoting healthy aging. They underscore the importance of NCDs control, polypharmacy prevention, protective environments, and healthy lifestyle promotion during aging. Furthermore, they emphasize the necessity of maintaining and guaranteeing social support programs for the older population.

The implications for caring in adult care day centers are: a) strengthen the processes of assessing the functional capacity of older adults, b) generating actions within the framework of the national public policy through the strategic action 'Healthy aging for an independent, autonomous and productive life in old age,' c) promoting intersectoral work in favor of health and well-being in old age and d) contributing to the understanding of risk factors related to functional limitation through scientific research.

Conflicts of interest

The authors declare that there is no conflict of interest.

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Ethical considerations

Protection of persons: This study is considered a low-risk investigation due to its nature. This study was approved by the Institutional Ethics Committee.

Data confidentiality: Authors declare that they have followed the protocols of their work center on the publication of patient data.

Informed consent and privacy: Authors followed data provider's policies and obtained consent to do a secondary data analysis. This document is in possession of the author mentioned in the article.

References

- Cafagna G, Aranco N, Ibararán P, Oliveri ML, Medellín N, Stampini M. Age with Care, Long-term Care in Latin America and the Caribbean. [Internet] United States;IDB:2019. Available from: <https://publications.iadb.org/en/age-care-long-term-care-latin-america-and-caribbean>
- Departamento Administrativo Nacional de Estadística. Resultados Censo Nacional de Población Nacional y Vivienda 2018. ¿Cuántos somos? ¿Dónde estamos? ¿Cómo vivimos? [Internet]. Colombia:DANE;2018. Available from: <https://www.dane.gov.co/files/censo2018/informacion-tecnica/cnpv-2018-presentacion-3ra-entrega.pdf>
- Hessel P, Rodríguez-Lesmes P, Torres D. Socio-economic inequalities in high blood pressure and additional risk factors for cardiovascular disease among older individuals in Colombia: Results from a nationally representative study. PLoS One [Internet]. 2020;15(6):e0234326. doi: <https://doi.org/10.1371/journal.pone.0234326>
- DC. Funcionalidad y factores asociados en el adulto mayor de la ciudad San Juan de Pasto, Colombia. Rev. Cienc. Salud [Internet]. 2018;16(1):114-28. doi: <https://doi.org/10.12804/revistas.urosario.edu.co/revsalud/a.6494>
- Ocampo-Chaparro JM, Reyes-Ortiz CA, Castro-Flórez X, Gómez F. Frailty in older adults and their association with social determinants of Health. The SABE Colombia Study. Colomb Med [Internet]. 2019;50(2):89-101. doi: <https://doi.org/10.25100/cm.v50i2.4121>
- Gómez F, Osorio-García D, Panesso L, Curcio CL. Healthy aging determinants and disability among older adults: SABE Colombia. Rev Panam Salud Publica [Internet]. 2021;45:e98. doi: <https://doi.org/10.26633/RPSP.2021.98>
- Gladyshev VN. The Ground Zero of Organismal Life and Aging. Trends Mol Med [Internet]. 2021;27(1):11-19. doi: <https://doi.org/10.1016/j.molmed.2020.08.012>
- Guttman D. Life events and decision making by older adults. Gerontologist [Internet]. 1978;18(5 Pt 1):462-467. doi: https://doi.org/10.1093/geront/18.5_Part_1.462
- Nóbrega-Leite JC, Medeiros-Barbosa J, Gomes-da Silva Freitas JL, Silva JMM, Mariz-Simões RF, Olinda R, et al. Psychosocial aspects and support networks associated with disability in two longevous populations in Brazil: a cross-sectional study. BMC Geriatr [Internet]. 2022;22(1):110. doi: <https://doi.org/10.1186/s12877-022-02810-4>
- Jaul E, Barron J. Age-Related Diseases and Clinical and Public Health Implications for the 85 Years Old and Over Population. Front Public Health [Internet]. 2017;5:335. doi: <https://doi.org/10.3389/fpubh.2017.00335>
- Lane NE, Boyd CM, Stukel TA, Wodchis WP. Operationalizing the Disablement Process for Research on Older Adults: A Critical Review. Can J Aging [Internet]. 2020;39(4):600-613. doi: <https://doi.org/10.1017/S0714980819000758>
- Verbrugge LM, Jette AM. The disablement process. Soc Sci Med [Internet]. 1994;38(1):1-14. doi: [https://doi.org/10.1016/0277-9536\(94\)90294-1](https://doi.org/10.1016/0277-9536(94)90294-1)
- Schure MB, Goins RT. An Examination of the Disablement Process Among Older American Indians: The Native Elder Care Study. Gerontologist [Internet]. 2016;56(5):948-955. doi: <https://doi.org/10.1093/geront/gnv001>

14. Baracaldo-Campo HA, Naranjo-García AS, Medina-Vargas VA. Nivel de dependencia funcional de adultos mayores institucionalizados en centros de bienestar de Floridablanca (Santander, Colombia). *Gerokomos*. 2019;30(4):163-166. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2019000400163
15. Ruelas-González MG, Obando-Guerrero LM, Betancourth-Zambrano S, Monterrubio-Flores E, Ojeda-Rosero E, Saturno-Hernández PJ. Adaptation and validation of the Screening Questionnaire for Family Abuse of the Elderly in the sociocultural context of Colombia. *Health Soc Care Community* [Internet]. 2021;29(6):e359-e367. doi: <https://doi.org/10.1111/hsc.13360>
16. Mahal A, McPake B. Health Systems for Aging Societies in Asia and the Pacific. *Health Syst Reform* [Internet]. 2017;3(3):149-153. doi: <https://doi.org/10.1080/23288604.2017.1356429>
17. Carmona-Torres JM, Rodríguez-Borrego MA, Laredo-Aguilera JA, López-Soto PJ, Santacruz-Salas E, Cobo-Cuenca AI. Disability for basic and instrumental activities of daily living in older individuals. *PLoS One*. [Internet]. 2019;14(7):e0220157. doi: <https://doi.org/10.1371/journal.pone.0220157>
18. García-González JV, Díaz-Palacios E, Salamea-García A, Cabrera-González D, Menéndez-Caicoya A, Fernández-Sánchez A, et al. Evaluación de la fiabilidad y validez de una escala de valoración social en el anciano. *Aten Primaria*. [Internet]. 1999;23(7):434-40. Available from: <https://pubmed.ncbi.nlm.nih.gov/10363397/>
19. Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr* [Internet]. 2022;41(4):958-989. doi: <https://doi.org/10.1016/j.clnu.2022.01.024>
20. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc*. [Internet]. 1991;39(2):142-148. doi: <https://doi.org/10.1111/j.1532-5415.1991.tb01616.x>
21. Borda-Borda M, Cano C, Ruiz C, Gutiérrez S, Ortiz A, Samper-Ternet R. Relationship between cognitive impairment and instrumental activities of daily living (IADL): SABE Bogotá, Colombia Study. *J Neurol Sci* [Internet]. 2015;357(Suppl1):e121. doi: <https://doi.org/10.1016/j.jns.2015.08.390>
22. Carvalho-Malta D, Ivata-Bernal RT, Saar-Gomes C, Santos de-Magalhães Cardoso L, Guimarães-Lima M, de-Azevedo Barros MB. Inequalities in the use of health services by adults and elderly people with and without non-communicable diseases in Brazil, 2019 National Health Survey. *Rev Bras Epidemiol* [Internet]. 2021;24(suppl2):e210003. doi: <https://doi.org/10.1590/1980-549720210003.supl.2>
23. Whitesides L, Lynn J. The Psychosocial Effects of Frailty on Women. *Clin Geriatr Med* [Internet]. 2021;37(4):543-552. doi: <https://doi.org/10.1016/j.cger.2021.05.003>
24. Oliveros E, Patel H, Kyung S, Fugar S, Goldberg A, Madan N, et al. Hypertension in older adults: Assessment, management, and challenges. *Clin Cardiol* [Internet]. 2019;43(2):99-107. doi: <https://doi.org/10.1002/clc.23303>
25. Kilander L, Nyman H, Boberg M, Hansson L, Lithell H. Hypertension is related to cognitive impairment: a 20-year follow-up of 999 men. *Hypertension* [Internet]. 1998;31(3):780-786. doi: <https://doi.org/10.1161/01.HYP.31.3.780>
26. Velasco-Hernandez BX, Salamanca-Ramos E, Velasco-Páez ZJ. Funcionalidad de los adultos mayores de los Centros Vida de Villavicencio—Colombia. *Rev. cienc. Cuidad* [Internet]. 2019;16(3):70-9. doi: <https://doi.org/10.22463/17949831.1556>
27. Zhang W, Zhang S, Deng Y, Wu S, Ren J, Sun G, et al. Trial of Intensive Blood-Pressure Control in Older Patients with Hypertension. *N Engl J Med* [Internet]. 2021;385(14):1268-1279. doi: <https://doi.org/10.1056/NEJMoa2111437>
28. Canavan M, Smyth A, Bosch J, Jensen M, McGrath ER, Mulkerrin EC, et al. Does lowering blood pressure with antihypertensive therapy preserve independence in activities of daily living? A systematic review. *Am J Hypertens* [Internet]. 2015;28(2):273-279. doi: <https://doi.org/10.1093/ajh/hpu131>
29. Moghtadaei M, Jansen HJ, Mackasey M, Rafferty SA, Bogachev O, Sapp JL, et al. The impacts of age and frailty on heart rate and sinoatrial node function. *J Physiol* [Internet]. 2016;594(23):7105-7126. doi: <https://doi.org/10.1113/JP272979>
30. Fernández A, Gómez F, Curcio CL, Pineda E, Fernandes de-Souza J. Prevalence and impact of potentially inappropriate medication on community-dwelling older adults. *Biomedica* [Internet]. 2021;41(1):111-122. doi: <https://doi.org/10.7705/biomedica.5787>
31. Ie K, Chou E, Boyce RD, Albert SM. Fall Risk-Increasing Drugs, Polypharmacy, and Falls Among Low-Income Community-Dwelling Older Adults. *Innov Aging* [Internet]. 2021;5(1):igab001. doi: <https://doi.org/10.1093/geroni/igab001>
32. González-Zapata LI, Restrepo-Mesa SL, Mancilla-López L, Sepúlveda-Herrera D, Estrada-Restrepo A. Inequalities in food consumption the Colombian households: Results from the National Survey of Nutritional Status. *Hacia Promoc Salud* [Internet]. 2021;26(1):98-117. doi: <https://doi.org/10.17151/hpsal.2021.26.1.9>