Functional performance and social relations among the elderly in Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil: a population-based epidemiological study

Funcionalidade e relações sociais entre idosos da Região Metropolitana de Belo Horizonte, Minas Gerais, Brasil: um estudo epidemiológico de base populacional

Funcionalidad y relaciones sociales de ancianos en el área metropolitana de Belo Horizonte, Minas Gerais, Brasil: un estudio de base poblacional

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Abstract

This study was conducted in a probabilistic sample of 2,055 elderly in Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, to examine components of social network (conjugal status and visits by the children, other relatives, and friends) and social support (satisfaction with personal relations and having persons on whom to rely) associated with limitations in performing basic activities of daily living (ADL). Multivariate analysis used the Hurdle model. Performance of ADL showed independent and statistically significant associations with social network (fewer meetings with friends and not having children) and personal support (dissatisfaction/indifference towards personal relations). These associations remained after adjusting for social and demographic characteristics, health status, and other indicators of social relations. Our results emphasize the need for greater attention to social network and social support for elderly with functional limitations and those with weak social networks and social support.

Disabled Persons; Social Support; Health of the Elderly

Resumo

Este trabalho foi conduzido em uma amostra probabilística de 2.055 idosos da Região Metropolitana de Belo Horizonte, Minas Gerais, Brasil, com o objetivo de examinar componentes da rede social (situação conjugal, visita de filhos, outros parentes e amigos) e do apoio social (satisfação com as relações pessoais e existência de pessoas com quem contar) associados à limitação para realizar atividades básicas da vida diária (ABVDs). A análise multivariada foi baseada no modelo Hurdle. A performance na realização de ABVDs apresentou associações independentes e significantes com a rede social (menos encontros com amigos e não possuir filhos) e o apoio social (insatisfação/indiferença com as relações pessoais). Essas associações persistiram após ajustamentos por características sociodemográficas, condição de saúde e outros indicadores das relações sociais. Nossos resultados reforçam a necessidade de maior atenção para a rede social e apoio social aos idosos com limitações funcionais, e para idosos com redes sociais e apoio social frágeis.

Pessoas com Deficiência; Apoio Social; Saúde do Idoso

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Introduction

The association between social relations and functional status, characterized by performance of basic activities of daily living (ADL) [1], has received growing attention due to rapid population aging around the world [2]. A systematic review of cohort studies from the 1980s and 1990s [3] showed that low frequency of social contacts was one determinant of future functional limitation, together with other biological, psychological, and social factors.

With few exceptions [4], more recent cohort studies confirmed these observations, besides identifying which components of social network and social support are associated with subsequent functional limitation. As for social network, the number of components (number of the elder's family members and number of friends and relatives to whom the elder feels close) [5,6,7,8], number of components in the family network (spouse, children, and siblings) [9], limited diversity in social relations (number of categories with which the elder has contact, such as children, grandchildren, siblings, other relatives, and friends) [10], limited social participation (social activities outside the home and visits to others) [9,11,12], as well as less contact with family members [5] and friends [8,13] to whom the elder feels close showed independent associations with future functional limitation. As for social support, dissatisfaction with social support [4,10], perception of receiving little social support [14], and large instrumental support (specific assistance such as provision of material needs in general and help with practical tasks such as house-cleaning, preparing meals, and provision of transportation) [7,10] have been described as determinants of worse functional performance, even after adjusting for other relevant factors.

To our knowledge, few population-based studies in Brazil have focused on the association between functional performance and social relations. The most consistently observed association is less contact with friends. This association was observed in both a longitudinal study [13] and various cross-sectional studies [15,16,17]. Negative associations between functional limitation and social and/or religious activities were also described in some cross-sectional studies [16,18]. In addition, a cross-sectional study of 101 elderly with cognitive impairment showed a univariate association between limitations in performing ADL and presence of emotional social support (the dimension of support that involves having persons to share concerns and trust) [19].

The current cross-sectional study was conducted in a representative sample of elderly individuals in Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, with the aim of examining associations between social relations and performance of ADL, considering social network and subjective social support.

Methodology

Data source

Data were used from the second health survey in Greater Metropolitan Belo Horizonte, the third largest metropolitan area in Brazil, both in population size (estimated at 5.5 million in 2012) and economic production (Instituto Brasileiro de Geografia and Estatística. *Indicadores Sociais Municipais: Uma Análise dos Resultados do Universo do Censo Demográfico 2010*. http://www.ibge.gov.br/home/estatistica/populacao/censo2010/indicadores_sociais_municipais/default_indicadores_sociais_municipais.shtm, accessed on 15/Sep/2012). The survey was conducted from May 1 to July 31, 2010, as a supplement of the *Employment and Unemployment Survey* conducted by the João Pinheiro Foundation, an agency of the Minas Gerais State Government [20]. The study was approved by the Ethics Research Committee of the René Rachou Research Center, Oswaldo Cruz Foundation, (case no. 10/2009).

The sample was designed to produce estimates of the non-institutionalized population ten years and older from the 26 municipalities in Greater Metropolitan Belo Horizonte. This was a two-stage stratified probabilistic cluster sample: in the first stage, strata were formed from the census tracts of the Brazilian Institute of Geography and Statistics (IBGE) and two tracts were picked from each stratum; in the second stage, 16 households were picked from the selected tracts in each stratum using systematic random sampling, totaling 7,500 households with some 24 thousand residents; interviews were conducted in 77.3% of the selected households. For the current study, all participants in the health survey that were 60 years or older (N = 2,271) were selected.

Study variables

The study's dependent variable was performance of ADL. Information was obtained with the question "*What degree of difficulty do you experience in performing the following activities?*" There were four possible answers: no difficulty, some difficulty, great difficulty, and only with help from others. The ADL were: toileting, bathing, dressing, eating, transferring from bed to chair, and

walking from one room to another on the same floor [21]. Limitation in the activity was defined as the report of performing the activity with some difficulty or great difficulty or the need for assistance from others [1]. This was considered a dichotomous as well as a count variable. In the first case, the report of limitation in one or more ADL was categorized as 1, and no limitation in any ADL as 0. The count variable varied from 0 (no limitation in any of the activities) to 6 (limitation in all the activities).

The independent target variables in this study were social relations. According to Curcio-Borrero [22], social relations have a structural or quantitative dimension (social network) and a functional or qualitative dimension (social support). Social network refers to interpersonal relations and ties; this function is generally studied in terms of number, frequency, diversity, and reciprocity of social relations. Social support refers to the interpersonal interactions that occur within a structure of social relations; this dimension covers qualitative, subjective, and behavioral aspects of social relations. In the current study, social network variables were defined according to conjugal status, living with children, and social contacts in the previous 30 days. These variables were defined according to frequency of visits by children and other relatives not living with the elder and by the number of friends, acquaintances, or neighbors that the elder met during that period.

Subjective social support was measured by two questions: (1) "*Do you have someone you can rely on (spouse, child, relative, or friends) or that you can confide in, ask for help, and share interests and fun?*", answered as yes or no, and (2) "*Considering your life as a whole, how do you feel about your personal relations?*", with the following possible answers: very satisfied/satisfied, indifferent, and dissatisfied/very dissatisfied.

Potential confounding variables in the study were social and demographic characteristics (age, sex, and complete years of schooling) and health status. Health status was defined according to two variables: (1) history of medical diagnosis of depression (yes, no) and (2) number of chronic diseases or conditions previously diagnosed by a physician; these diseases included hypertension, diabetes, cancer, chronic obstructive pulmonary disease, chronic renal disease, heart disease, stroke, back disease, and osteoarthritis. History of medical diagnosis for each disease was measured by the following question: "*Has a physician ever said you have ...?*". Depression was recorded separately from the other diseases, since the target variables were self-reported and could thus be modified by the presence of depression.

Data analysis

Pearson's chi-square test was used to orient interpretation of the results from the univariate analysis. The multivariate analysis was based on the Hurdle regression model [23]. This model was used because (1) the dependent variable (number of ADL performed with limitations) presented over-dispersion ($\alpha = 0.01$; $p < 0.01$) and (2) excess number of zeroes (large proportion of individuals without limitations in ADL: 80.3%). The Hurdle regression model combines a binary model (functional limitation; yes and no) with a count model (number of activities with limitations). The current study used the negative binomial model and zero-inflated negative binomial model (ZINB), respectively [24]. We chose to use prevalence ratios (PR) rather than odds ratio (OR), since we expected high prevalence ratios for the target variables [25]. Social and demographic characteristics and health status were considered a priori confounding variables for the study and were kept in the final multivariate model.

Since age is associated with performance of ADL, we used graphs to attempt to visualize how satisfaction with personal relations affects this association. Negative binomial regression was thus used to estimate the expected probability of one or more limitations in ADL, according to age and stratified by satisfaction with personal relations (Figure 1). A similar model was implemented using ZINB to estimate the expected number of activities with limitations (Figure 2).

All the analyses used procedures for population surveys with complex samples from Stata version 12 (Stata Corp., College Station, USA), considering the sampling parameters (individual weight, design effect, and household clustering of individuals).

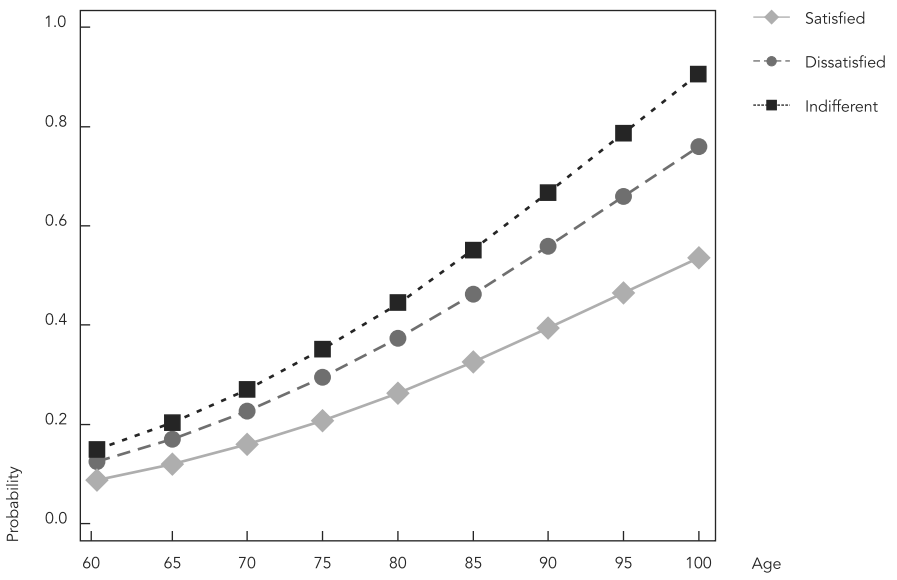
Results

Among the 2,271 participants in the sample from the health survey in Greater Metropolitan Belo Horizonte that were 60 years or older, 2,055 (90.5%) had complete information on all the study variables and were included in the current analysis. As for functional performance, 19.7% reported a limitation in performing at least one ADL; of these, the mean number of ADL with limitations was 3.4.

Table 1 shows the distribution of social and demographic characteristics and health status of all the study participants and according to the number of ADL performed with limitations. Mean age of participants was 70.1 years (SD =

Figure 1

Expected probability * of limitations in one or more basic activities of daily living (ADL) in different ages, according to satisfaction with personal relations. Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, 2010.



* Adjusted according to social and demographic characteristics (sex, age, and complete years of schooling), health status (depression and number of other chronic diseases), and social relations [conjugal status, living with children, frequency of social contacts in the previous 30 days (children, other relatives, and friends), presence of someone to rely on and satisfaction with personal relations].

0.21), with a majority of females (60.4%) and individuals with less than 8 years of schooling (91.9%). Prevalence of medically diagnosed depression was 9%, and 71.7% had a diagnosis of at least one other chronic disease. In the univariate analysis, sex, age bracket, and number of chronic diseases showed statistically significant associations ($p < 0.05$) with performance of ADL.

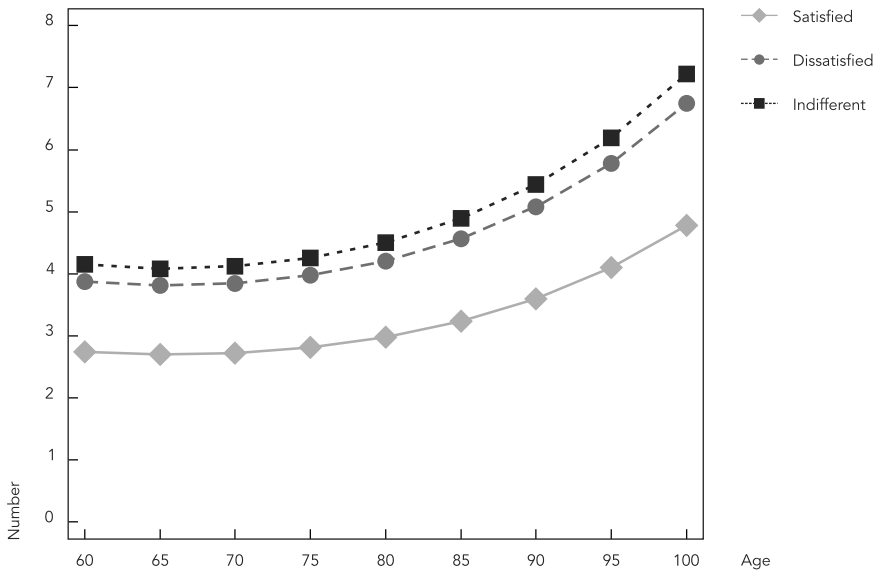
Table 2 shows the distribution of social relations variables among all participants and according to number of ADL with limitations. As for social network, 51% had a spouse, 56.4% lived with their children, 27.2% received daily or near-daily visits from the children living in other households, 26% received weekly visits from other relatives, and 73.7% had met with three or more friends in the previous 30 days. In terms of social support, 91.4% reported having someone they could rely on and 81.3% were satisfied with their personal relations. The univariate analysis showed that conjugal status, frequency of visits by the children in the previous 30 days, number of meetings with friends during the same period, and satisfaction with personal relations were all significantly associated with performance of ADL.

Table 3 shows the statistically significant results in the multivariate analysis for factors associated with performance of ADL. Female gender, age 70 years or older, having at least one chronic disease, having met with at least one friend in the previous 30 days, and being indifferent to or dissatisfied with one's personal relations increased the propensity to show limitations in the performance of one or more ADL. As for the expected number of ADL with limitations, elders that had met with 1 or 2 friends in the previous 30 days showed a lower number (versus those with 3 or more friends), while elders that were indifferent to or dissatisfied with their personal relations (versus those who were satisfied), had no children (versus living with their children), and females showed a higher number of ADL with limitations.

Figure 1 shows the expected probabilities of limitations in performing one or more ADL at different ages, according to satisfaction with personal relations. At all ages, limitations in ADL

Figure 2

Expected number * of basic activities of daily living (ADL) performed with limitations among elderly that reported limitations in at least one ADL, in different ages, according to satisfaction with personal relations. Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, 2010.



* Adjusted according to social and demographic characteristics (sex, age, and complete years of schooling), health status (depression and number of other chronic diseases), and social relations [conjugal status, living with children, frequency of social contacts in the previous 30 days (children, other relatives, and friends), presence of someone to rely on and satisfaction with personal relations].

were more likely among individuals that were indifferent to personal relations, followed by those that were dissatisfied. The lowest probability of limitations in one or more ADL was among elders that were satisfied with their personal relations, in all ages (Figure 1). Similar trends to the ones cited above were observed in the expected number of ADL with limitations (Figure 2), i.e., in all ages these numbers were lower among individuals satisfied with their personal relations and higher among those who were indifferent or dissatisfied.

Discussion

According to the current study, among social network and social support variables, lack of meetings with friends and dissatisfaction or indifference towards personal relations showed the strongest associations with limitations in one or more ADL. These associations persisted after adjusting for social and demographic characteristics, health status, and other indicators of social relations. Older age, female gender, and number of comorbidities also showed independent associations with the presence of limitations in performing one or more ADL, corroborating other studies [15,26]. However, the associations between target characteristics and the number of ADL performed with limitations were less evident in the current analysis, limited to female gender, lack of children, and dissatisfaction/indifference towards personal relations.

Some hypotheses, which are not mutually exclusive, can be raised to explain the association between fewer contacts with friends and functional limitation. According to the theory of socioemotional selectivity proposed by Carstensen [27], the decrease in social contacts among the elderly results from a selection process that develops over life, in which the elderly primarily maintain relations of emotional closeness with family members and close friends. Thus, social contacts are maintained to maximize emotional and social gains and minimize risks, showing that it is

Table 1

Distribution of social and demographic and health status characteristics among all study participants and according to performance of basic activities of daily living (ADL) * in a sample of elderly in Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, 2010.

Variables	Number of ADL with limitations				
	Total	0	1-3	4-6	p-value **
	%	%	%	%	
Sex					
Male	39.6	85.9	8.8	5.3	< 0.001 ***
Female	60.4	76.7	12.5	10.9	
Age (years)					
60-64	30.7	89.9	6.0	3.6	< 0.001 ***
65-69	23.8	86	9.2	4.7	
70-74	19.2	79.5	12.2	8.3	
75-79	12	74.9	14.4	10.7	
≥ 80	14.3	55.7	20.4	23.9	
Mean age (standard deviation)	70.1 (0.21)	68.9	73.7	76.9	
Schooling (complete years)					
≥ 8	8.1	83.6	7.3	9.1	0.055
4-7	48.0	81.7	10.8	7.5	
0-3	43.9	78.2	12.0	9.8	
Medical diagnosis of depression					
No	91.0	80.3	10.9	8.7	0.227
Yes	9.0	79.0	12.6	8.4	
Number of medical diagnoses of chronic diseases					
0	28.3	89.2	6.4	4.4	< 0.001 ***
1-3	62.6	78.9	11.5	9.5	
≥ 4	9.1	61.9	22.0	16.1	
Total (n) #	2,072	1,665	221	186	

Note: estimated percentages, considering the sampling parameters.

* Toileting, bathing, dressing, eating, transferring from bed to chair, walking from one room to another on the same floor;

** Based on Pearson's chi-square test;

*** Statistically significant values ($p < 0.05$);

Number of interviewees, not including corrections according to sampling parameters.

not the number of friends that matters, but the emotional benefits they bring. Thus, the first hypothesis for explaining the negative association between functional performance and number of contacts with friends is greater socioemotional selectivity by the elderly with limitations in performing ADL. Social contacts with others are known to sustain a feeling of social belonging, and this feeling can foster health benefits through physiological and psychological benefits [8]. Independently of the direct personal contact, the emotional benefits can be maintained through phone calls and letters, preserving the feelings of closeness [28]. Thus, the second hypothesis for explaining our results is that the elderly with functional limitations have more contact with their friends through other means. Unfortunately, our data do not allow testing this hypothesis, since the research instrument only measured face-to-face contacts. The third hypothesis is that functional limitation leads to withdrawal from friends, whether due to greater difficulty in contact or for some other reason.

Evidence suggests that cultural differences can modify social behaviors [29], as well as satisfaction with life and friends [30]. Zunzunegui et al. [9] assessed the influence of presence or absence of friends on the incidence and prevalence of functional limitation among elderly in three different countries (Finland, Netherlands, and

Table 2

Distribution of social relations characteristics among all study participants and according to performance of basic activities of daily living (ADL) * in a sample of elderly in Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, 2010.

Variables	Number of ADL with limitations				
	Total	0	1-3	4-6	p-value **
	%	%	%	%	
Conjugal status					
With spouse	51.0	86.0	8.2	5.8	< 0.001 ***
Without spouse	49.0	74.4	14.0	11.6	
Living with children					
Yes	56.4	79.5	12.4	8.2	0.3
No	34.2	80.1	10.4	9.5	
Does not have children	9.4	86.0	5.6	8.4	
Frequency of children's visits in previous 30 days					
Daily or almost daily	27.2	80.0	9.8	10.2	0.032 ***
Once a week	23.6	77.3	15.1	7.6	
Once a month	21.8	82.1	8.9	9.0	
< Once a month	15.2	77.3	13.8	8.9	
Does not have children or lives with children	12.2	87.3	6.3	6.4	
Frequency of visits by other relatives in previous 30 days					
≥ Once a week	26.0	79.0	11.7	9.3	0.823
Once a month	36.9	82.0	9.8	8.2	
< Once a month	37.1	79.5	11.7	8.7	
Number of meetings with friends in previous 30 days					
≥ 3	73.7	83.9	8.9	7.2	< 0.001 ***
1-2	17.6	71.4	18.5	10.1	
0	8.7	67.9	13.9	18.2	
Has someone to rely on					
Yes	91.4	80.8	10.6	8.6	0.356
No/Not certain	8.6	75.4	15.1	9.5	
Satisfaction with personal relations					
Very satisfied/Satisfied	81.3	82.3	11.1	6.6	
Indifferent	5.9	63.6	12.9	23.5	< 0.001 ***
Very dissatisfied/Dissatisfied	12.8	75.5	9.8	14.7	
Total (n) #	2,072	1,665	221	186	

Note: estimated percentages, considering the sampling parameters.

* Toileting, bathing, dressing, eating, transferring from bed to chair, walking from one room to another on the same floor;

** Based on Pearson's chi-square test;

*** Statistically significant values ($p < 0.05$);

Number of interviewees, not including corrections according to sampling parameters.

Spain). The authors observed that prevalence of functional limitation was associated with having fewer friends in Finland and the Netherlands, but not in Spain; incidence of functional limitation was not associated with this variable in any of these countries. Brazil shows consistent evidence that both prevalent [15,16,17] and incident functional limitation [13] are negatively associated with the number of contacts with friends. The current study's results are consistent with these observations.

Satisfaction with personal relations is an overall indicator of perceived social support and a complex phenomenon, given its subjective nature. Assessment of satisfaction depends on a comparison of the circumstances in the individual's personal relations with a standard established by that person and may partly reflect

Table 3

Statistically significant results in multivariate analysis of factors associated with performance of basic activities of daily living (ADL) *. Greater Metropolitan Belo Horizonte, Minas Gerais State, Brazil, 2010.

Variable	Limitations in at least one ADL		Number of ADL with limitations	
	PR **	95%CI	PR ***	95%CI
Female gender [vs. male]	1.33	1.05-1.69 #	1.17	1.01-1.35 #
Age [vs. 60-64] (years)				
65-69	1.36	0.94-1.97	0.89	0.69-1.14
70-74	1.95	1.40-2.73 ##	1.02	0.83-1.25
75-79	2.03	1.41-2.94 ##	0.94	0.75-1.19
≥ 80	3.19	2.33-4.36 ##	1.21	0.99-1.48
Medical diagnoses of chronic diseases [vs. 0]				
1-3	1.73	1.30-2.30 ##	1.00	0.84-1.20
≥ 4	3.01	2.11-4.30 ##	0.99	0.69-1.17
Living with children [vs. yes]				
No	0.98	0.80-1.21	1.11	0.97-1.27
Does not have children	0.83	0.48-1.43	1.61	1.12-2.32 #
Number of meetings with friends in previous 30 days [vs. ≥ 3]				
1-2	1.50	1.19-1.88 ##	0.82	0.70-0.97 #
0	1.45	1.15-1.85 ##	1.03	0.86-1.24
Satisfaction with social relations [vs. satisfied]				
Indifferent	1.72	1.36-2.17 ##	1.49	1.25-1.77 ##
Dissatisfied	1.40	1.08-1.81 #	1.41	1.21-1.64 ##

95%CI: 95% confidence intervals; PR: prevalence ratios.

* Toileting, bathing, dressing, eating, transferring from bed to chair, walking from one room to another on the same floor;

** Estimated by negative binomial regression model;

*** Estimated by zero-inflated negative binomial regression model (ZINB), adjusted for social and demographic characteristics (sex, age, and complete years of schooling), health status (depression and number of other chronic diseases), and social relations (conjugal status, living with children, frequency of social contacts in previous 30 days (children, other relatives, and friends), presence of someone to rely on, and satisfaction with personal relations);

# $p < 0.05$;

$p < 0.01$.

his or her subjective quality of life [31]. In the current study, satisfaction with these relations was widely predominant, having been reported by 81% of all participants. However, this satisfaction was significantly affected by the elder's functional status. Compared to those without limitations, elderly with limitations in at least one ADL were 34% to 67% more prone to being dissatisfied or indifferent (an indicator of dissatisfaction) towards their personal relations. This finding was consistent across all ages, even after adjusting for other relevant factors. Considering the number of ADL performed with limitations, the same association was seen, with greater propensity to dissatisfaction or indifference towards personal relations among those with more limitations.

The current study did not show any association between functional limitation and the presence of someone to rely on or confide in, ask for assistance, and share interests and fun. These characteristics involve different dimensions such as emotional support, instrumental support, and positive interaction [32]. The use of only one question in this study, encompassing different dimensions, may have underestimated the strength of the resulting associations, and this is one of the study's limitations. Another limitation relates to the breadth of the question on satisfaction with personal relations, preventing separate assessment of satisfaction in relations with various relatives and friends, as well as with social activities and intimacy [33] or material, instrumen-

tal, and emotional support, information, and positive interaction [32]. It is also not possible to rule out a same-source bias, that is, the exclusive use of self-reported variables to measure both functional performance and social relations [34]. This bias is difficult to eliminate, since the quality of social relations is by definition a subjective evaluation. Another limitation to the study is its cross-sectional design, which impedes establishing temporal relations between the independent variables and the dependent variable. Meanwhile, the study has several advantages, including: (1) the large population base, (2) the sample design, allowing inference to the elderly population in one of Brazil's largest metropolitan areas, and (3) the study's methodological rigor, guaranteeing its internal validity.

As discussed previously, various cohort studies have shown that social relations are determinants of future performance of ADL in the elderly [3,5,6,7,8,9,10,11,12,13,14]. Other cohort studies have shown that both emotional support [8] and size of total social network (especially the family network) [7] predict not only future functional limitation but also recovery from it, suggesting a bidirectional association. Our results call attention to the need for a greater focus on social network and social support for the elderly with functional limitations and those with weak social network and social support. The results also emphasize the need for longitudinal studies in Brazil for a better understanding of the direction in associations between functional performance, social network, and social support in the elderly.

Resumen

Este estudio fue realizado en una muestra probabilística de 2.055 ancianos del área metropolitana de Belo Horizonte, Minas Gerais, Brasil, buscando examinar los componentes de la red social (estado civil, visitas de nietos, otros familiares y amigos) y del apoyo social (satisfacción con las relaciones personales y existencia de personas a quien poder recurrir), asociados con la limitación en actividades básicas de la vida diaria (ABVDs). El análisis multivariado se basó en el modelo Hurdle. La dificultad en la realización de las ABVDs tuvo asociaciones independientes y significativas con la red social (menos encuentros con amigos y no tener niños) y el apoyo social (insatisfacción/indiferencia con las relaciones personales). Estas asociaciones persistían después de los controles por características sociodemográficas, condición de salud y otros indicadores de relaciones sociales. Nuestros resultados sugieren la necesidad de una mayor atención para la red social y apoyo social a los ancianos con limitaciones funcionales y para aquellos con redes y apoyo social frágiles.

Personas con Discapacidad; Apoyo Social; Salud del Ancino

Contributors

J. L. Torres participated in the study project's conceptualization, data analysis and interpretation, writing of the article, and approval of the final version for publication. R. C. Dias, F. R. Ferreira and J. Macinko collaborated in the data analysis and interpretation, relevant critical revision of the intellectual content, and approval of the final version for publication. M. F. Lima-Costa contributed to the project's conceptualization, data analysis and interpretation, writing of the article, relevant critical revision of the intellectual content, and approval of the final version for publication.

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