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Original article

Mortality of elderly people in home care according to frailty and functional capacity

Mortalidade de pessoas idosas em atenção domiciliar de acordo com a fragilidade e capacidade funcional

Mortalidad de personas mayores en atención domiciliaria según fragilidad y capacidad funcional

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Abstract

Objective: to analyze mortality rates among elderly people in type 1 Home Care according to the functional capacity and frailty, in the context of the COVID-19 pandemic. **Method:** longitudinal study. Phase 1 was developed between 2018 and 2019, at a home, with 124 elderly people, including sociodemographic data, Edmonton Frail Scale, Lawton and Brody Scale and Barthel index. Phase 2 occurred via telephone contact, between 2021 and 2022. The analyses were descriptive and inferential, using the chi-square test. **Results:** among the elderly people who died, 67.3% had moderate or severe frailty, exhibiting moderate dependence in Basic Activities of Daily Living, with an average of 47 (\pm 31.6), and great severe dependence in Instrumental Activities of Daily Living, with an average of 13.2 (\pm 4.6), when compared to survivors. **Conclusion:** elderly people who were more frail and had lower functional capacity had a higher mortality rate. **Descriptors:** Mortality; Frail Elderly; Primary Health Care; Health of the Elderly; Home Care Services

Resumo

Objetivo: analisar as taxas de mortalidade entre pessoas idosas da Atenção Domiciliar tipo 1 de acordo com a capacidade funcional e a fragilidade, no contexto da pandemia da COVID-19. **Método:** estudo longitudinal. A fase I foi desenvolvida entre 2018 e 2019, no domicílio, com 124 pessoas idosas, incluindo dados sociodemográficos, Escala de Fragilidade de Edmonton, Escala de Lawton e Brody e Índice de Barthel. A fase II ocorreu por contato telefônico, entre 2021 e 2022. As análises foram descritivas e inferenciais, utilizando-se o teste qui-quadrado. **Resultados:** dentre as pessoas idosas que foram a óbito, 67,3% tinham fragilidade moderada ou severa, apresentando dependência moderada em Atividades Básicas de Vida Diária, média de 47 (\pm 31,6), e maior dependência grave para as Atividades Instrumentais de Vida Diária, média de 13,2 (\pm 4,6), quando comparados aos sobreviventes. **Conclusão:** as pessoas idosas mais frágeis e com menor capacidade funcional tiveram taxa de mortalidade maior.

Descritores: Mortalidade; Idoso Fragilizado; Atenção Primária à Saúde; Saúde do Idoso; Serviços de Assistência Domiciliar



Resumen

Objetivo: Analizar las tasas de mortalidad entre los adultos mayores que reciben Atención Domiciliaria Tipo 1 según la capacidad funcional y la fragilidad, en el contexto de la pandemia de COVID-19. **Método:** Estudio longitudinal. La fase I se realizó entre 2018 y 2019, en los hogares de 124 adultos mayores, incluyendo datos sociodemográficos, la Escala de Fragilidad de Edmonton, la Escala de Lawton y Brody y el Índice de Barthel. La fase II se realizó mediante contacto telefónico entre 2021 y 2022. Los análisis fueron descriptivos e inferenciales, utilizando la prueba de chi-cuadrado. **Resultados:** Entre los adultos mayores que fallecieron, el 67,3% tenía fragilidad moderada o severa, presentando dependencia moderada en Actividades Básicas de la Vida Diaria, con una media de 47 ($\pm 31,6$), y mayor dependencia severa en Actividades Instrumentales de la Vida Diaria, con una media de 13,2 ($\pm 4,6$), en comparación con los sobrevivientes. **Conclusión:** los adultos mayores frágiles con menor capacidad funcional tuvieron una mayor tasa de mortalidad.

Descriptores: Mortalidad; Anciano Frágil; Atención Primaria de Salud; Salud del Anciano; Servicios de Atención de Salud a Domicilio

Introduction

During the COVID-19 pandemic, it became evident that the elderly population presented greater vulnerability and lethality to the disease. This is also due to the high frequency of multiple chronic health problems among elderly people, when compared to the rest of the population.¹ There is a strong relationship between increasing age and multiple morbidities, with a higher risk for the incidence of unfavorable clinical outcomes, including mortality.²⁻³ Furthermore, frailty along with comorbidities, likely contributed to vulnerability to death and severe illness from COVID-19 among the elderly population.⁴

Frail elderly people are among those most in need of health care; therefore, frailty can be used as a basis for organizing and managing health care for this population. In this sense, frailty can be understood as a state of increased risk of mortality and health problems, including falls, injuries, and acute illness, as well as a higher incidence of hospitalizations, since it is a condition characterized by a decline in the function of various homeostatic systems.⁵ To classify frailty, multidimensional assessment instruments can be used, including the Edmonton Frail Scale, used in this study.⁶⁻⁷

In front of this, it is important to address frailty in Primary Health Care (PHC), considering that it can influence the decline in the functional capacity of elderly people, which can lead them to a state of greater dependence on care.⁸ This functional

dependence is characterized by the inability to maintain physical and mental skills that are necessary for an independent and autonomous life. Elderly people affected by frailty may have limitations in performing activities related to self-care, Basic Activities of Daily Living (BADLs), and in performing activities related to organizing daily routine, Instrumental Activities of Daily Living" (IADLs).⁹

In addition, especially when observed in the context of COVID-19 pandemic, the consequences of social isolation and the emotional loneliness increase the vulnerability of elderly people to depression and expose them to a higher risk of death.¹⁰⁻¹¹ Research points out that the survival of these people is impacted by functional capacity, multimorbidity and frailty.¹² Furthermore, a study held in Campinas, São Paulo (SP) found that those who had difficulty to perform IADLs were more susceptible to death.¹³

Prior to the COVID-19 pandemic, Severe Acute Respiratory Syndrome (SARS) and their consequences already affected the elderly population; however, unfavorable outcomes and increased mortality have intensified. Moreover, considering the number of deaths among elderly people due to COVID-19, there was a contribution to the decrease in life expectancy among Brazilians.¹⁴

In front of this factors, this population is considered to be the one that most need home care, generally due to greater difficulties in accessing health services. Home Care can be divided into Type 1 (HC1), under the responsibility of PHC, and Type 2 and Type 3, under the responsibility of Home Health Care.¹⁵⁻¹⁶

According to bibliographic searches in national and international databases, the scarcity of studies focused on the elderly population using HC1, especially with a longitudinal approach focused on analyzing mortality in the context of the COVID-19 pandemic, according to frailty and functional capacity. This work is relevant because it provides important information to the primary health care professionals PHC, improving the development of care practices and the organization of work for a specific and under-explored group. Furthermore, it provides subsidy to future studies on aspects related to the access of elderly people to health services and the strengthening of the bond between this population and health teams. Thus, the aim of this research was to analyze mortality rates among elderly people with HC1 according to functional capacity and frailty, in the context of the COVID-19 pandemic.

Method

A prospective longitudinal observational study, developed in two phases. Phase 1 was conducted in 2018 and 2019, and Phase 2 in 2021 and 2022. This type of study has a higher level of evidence than other observational studies, allowing various variables to be evaluated, which can later be used in the development of interventions.¹⁷ The study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol for observational studies reports.

The population of the municipality of Porto Alegre is approximately 1.5 million inhabitants, of which 292,000 are elderly, representing 21.9% of the population.¹⁸ The services of the Unified Health System in the municipality are distributed across the territories of the 17 health districts.

The health district chosen to perform the research represents 19.7% of the total population of the municipality (approximately 277,000 inhabitants), and more than 28% of the population in that district is 60 years old or older. It is structured by three primary health care services.¹⁹

Initially, in phase 1 of the study, the starting point was a list of 225 elderly people enrolled in HC1 of that district. Based on the inclusion and exclusion criteria, a sample of 124 participants was obtained, which was considered in its entirety for phase 2.

People aged 60 or older, linked to HC1 in the study district, were included for both phases. Those individuals who did not answer the phone after four attempts on different days and time, or after an unsuccessful home visit attempt, were excluded.

For the calculation of the Phase 1 sample was used the WinPepi version 11.65. Considering a minimum correlation of 0.25 between the scales that assess the main variables of the study, were obtained a significance level of 5% and a statistical power of 80%, resulting in a sample of 124 participants.²⁰

For phase 2, were contacted all the elderly people that participated in phase 1, and out of 124 people were located 84, of whom 32 were survivors and 52 had died. Thus, for the mortality analysis, 84 individuals were considered, either located or with death information obtained from family members.

Phase 1 of the study was conducted in the homes of users linked to Home Care Services of the Primary Health Care Units (PHCUs) of a district of the Municipality of Porto Alegre. Phase 2 was conducted via telephone contact using the list of elderly individuals in HC1 who were interviewed in Phase 1 of this study.

In Phase 1, data were collected in the homes of the participants using the following instruments: a questionnaire with sociodemographic data, the Edmonton Frail Scale, the Barthel Index, and the Lawton and Brody Scale to assess the frailty and functional capacity of these participants. The data obtained in phase 1 of the project (functional capacity and frailty) were used to perform the mortality analysis in phase 2.

The Edmonton Frail Scale was translated, adapted and validated for the Brazilian context, and is composed by 9 domains, represented by 11 items: cognition, general health status, description of health, functional independence, social support, medication use, nutrition, mood, continence and functional performance. Frailty assessment scores range from 0 to 17 and they are classified in: no frailty (0 to 4), apparently vulnerable (5 to 6), mild frailty (7 to 8), moderate frailty (9 to 10), severe frailty (11 or more), with 17 being the maximum score on the scale, which represents the highest degree of frailty. Based on the results presented on the scale, as well as the other instruments described below, mortality among elderly people linked to HC1 of the PHC were analyzed.⁶ For the purposes of this study, the results were presented at two levels of frailty: more frail (moderate or severe frailty) and less frail (no frailty, apparently vulnerable or mild frailty).

The Barthel Index was validated for use in Brazil, to assess the ADLs and measure functional independence in personal care, mobility, locomotion and, elimination. Therefore, the instrument assesses functional capacity in ten items: feeding, bathing, dressing, personal hygiene, bowel eliminations, bladder eliminations, toilet use, chair-bed transition, ambulation and stairs. The total score of the instrument ranges from 0 to 100, being considered: totally dependent (below 20); highly dependent (20 to 35); moderately dependent (40 to 55); minimally dependent (60 to 99); independent (100), considering that the Barthel Index ranges from 0 to 100 points and that the lower the score, the greater the dependence.²¹⁻²²

The Lawton and Brody Scale assesses nine IADL (Instrumental Activities of Daily Living) items that indicate the capacity of the individual to lead an independent life

within the community, such as: using the telephone, shopping, preparing meals, cleaning the house, doing laundry, using transportation, taking medication, managing a budget, and walking. The maximum score is 27 points, with one to three points awarded for each activity ("Without help" - three points; "With partial help" - two points; "Cannot" - one point), the higher the total score, the greater the independence of the elderly people, with scores ranging from 9 points - totally dependent; 10 to 15 points - severe dependence; 16 to 20 points - moderate dependence; 21 to 25 points - mild dependence; 26 to 27 points - independent.

The data of interest were typed and stored in an Excel® program spreadsheet, with double entry. Consistency checks between two databases were performed, when any inconsistencies were found, the original interview was verified and corrected. Subsequently, the spreadsheet was transferred to the *Statistical Package for the Social Sciences (SPSS) for Windows* version 21.0 software, for statistical analysis.

In the descriptive analysis, means and standard deviations or medians and interquartile ranges were calculated for quantitative variables, and categorical variables were expressed as absolute and relative frequencies. The chi-square test was used to assess the association of variables of interest, considering a significant level of $p<0,05$.

The research was carried out according to the required ethical standards (Resolutions 466/2012, 510/2016 and 580/2018, of the Ministry of Health). The project was approved by the Research Ethics Committee (CEP) of the Hospital of Clinics of Porto Alegre (HCPA), under opinion no. 2.900.696, and by the Municipal Health Department of Porto Alegre.

In phase 1, a Free Informed Consent Form was applied to elderly people, sign in duplicate, one copy for the researchers and the other one for the study participants. In phase 2, a telephone call script was used, in which the reaffirming of tacit consent was included, to the contact and collect data from participants by telephone.

Results

Sociodemographic variables of mortality, functional capacity and frailty were analyzed. From 124 elderly people in Phase 1, 52 died, 32 survived, and 40 could not be located. Table 1 describes the sociodemographic characteristics for the years 2018 and

2019 of the baseline sample, including individuals who died and those who survived.

It was observed that the percentage of women and widows was similar in the deceased and survivor groups. Furthermore, the numbers relating to elderly people who received social support were lower among the survivors (Table 1).

Furthermore, it was verified that 76.9% of deaths were female, with a higher prevalence among those who were over 80 years old (67.3%). In addition, the widowers had a higher percentage of deaths (53.9%) and those who have always had social support (94.2%).

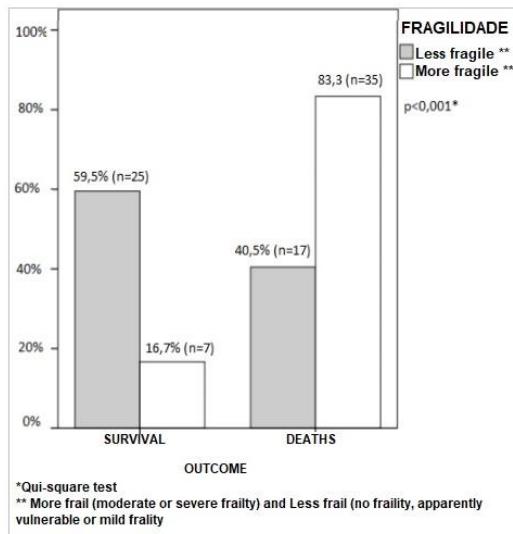
Table 1 – Sociodemographic characteristics of the baseline sample of elderly people who died and of the survivors. Porto Alegre, 2018 and 2019

Variables/Sample	Phase 1		Phase 2	
	Total N = 124 (%)	Deaths N= 52 (%)	Survivors N = 32 (%)	
Sex				
Female	94 (75.8)	40 (76.9)	25 (78.1)	
Age	83.50 [77 - 89]*	86 [80 - 91]*	83.50 [77.25-88.25]*	
Marital status				
Married	33 (26.6)	13 (25)	9 (28.1)	
Single/Divorced	32 (25.8)	11 (21.1)	7 (21.9)	
Widower	59 (47.6)	28 (53.9)	16 (50)	
No. of people in the household	[2 - 3]*	[2 - 3]*	[1 - 3]*	
Social Support				
Always	108 (87.1)	49 (94.2)	18 (56.3)	
Sometimes	16 (12.9)	3 (5.8)	14 (43.8)	

*Data expressed as medians [percentile 25 – percentile 75]

According to Figure 1, 83.3% of the most frail individuals died in 2022. Among those who were less frail, 40.5% died. Of the total deaths, 32.7% were from the least frail sample, and 67.3% from the most frail sample. It was verified that, among elderly people who died, there was a higher proportion of frail individuals compared to survivors ($p<0.01$)

Figure 1 – Mortality rate (2022) according to frailty levels of elderly people, Porto Alegre, 2019



It can be concluded from figure 2 that survivors had a higher average on the Barthel Index (78.2), meaning they were considerably more independent, while participants who died were more dependent, with an average of 47 on the scale in 2019. It was observed that lower functional capacity for performing ADLs in 2019 was associated with higher mortality in 2022 ($p=0.007$).

Figure 2 – Association between outcome (mortality/survival, 2022) and average functional capacity performance (Barthel Index, 2019) of elderly people, Porto Alegre, 2019-2022

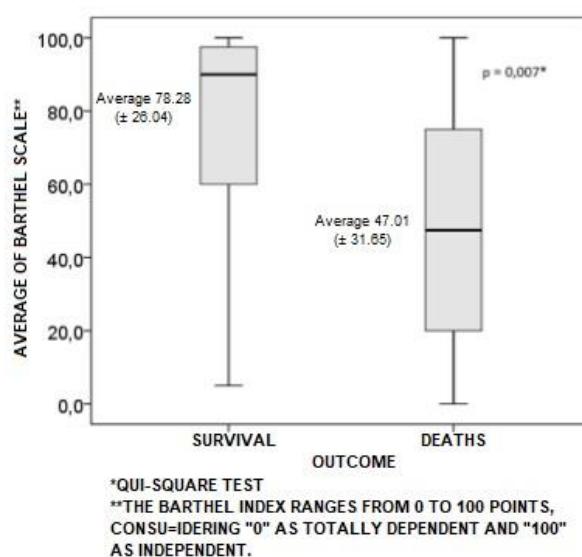
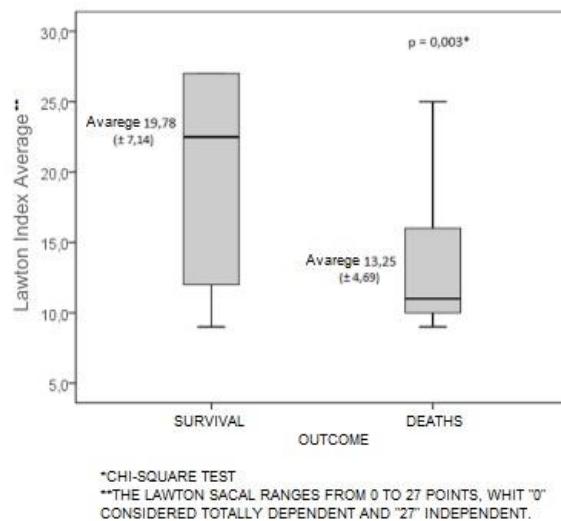


Figure 3 indicates that survivors had a higher average on the Lawton Scale (19.7), while participants who died had an average score of 13.2 on the scale in 2019. In this research was verified that lower functional capacity for performing IADLs in 2019 was associated with higher mortality in 2022 ($p=0.003$).

Figure 3 – Association between outcome (mortality/survival, 2022) and mean of functional capacity performance (Lawton and Brody Scale, 2019), Porto Alegre, 2019-2022



Discussion

The discoveries of this research showed that, among the elderly people who died, there was a higher proportion of frail individuals compared to the survivors, and that lower functional capacity for performing ADLs and IADLs in 2019 was associated with a higher probability of death in 2022.

In this study, considering the total number of deaths, after approximately three years since the first evaluation, there was a prevalence of the females (76.9%), given that the total baseline sample also had a higher percentage of elderly women. However, considering sex in isolation, there was a higher occurrence of deaths among elderly men (63.2%) compared to women (61.5%). These discoveries corroborate a literature review that shows that frail elderly men have a higher risk of mortality than frail elderly women.²³

Elderly people who were 80 years old or older had a higher mortality rate, as did a retrospective and multicenter study of cohort performed in China with 191 patients with a COVID-19 diagnosis, which showed a higher chance of death in older patients with higher frailty scores.²⁴

Regarding marital status, in this investigation, most of elderly people who died were widowers, converging with a national investigation carried out with 121 elderly people followed by AD, which showed that most part of participants (55.9%) with adverse events (hospital readmission or death) were not married.¹²

It was found that elderly people who always received social support when needed had a higher mortality rate, while those who did not have or only sometimes received social support had a lower death rate. In contrast to this result, a cohort study identified that the lack of social support for elderly people in the community, especially for transportation to health services, was associated to mortality.²⁵ However, it is important to highlight that in this research the prevalence of elderly people that always had social support was 89.3%, possibly due to the high prevalence of frailty and functional dependence in the sample.

In this study the elderly people that showed moderate or severe frailty had a higher mortality rate, while those who were not frail, vulnerable or had mild frailty had a lower rate. Accordingly, studies have indicated that frailty is a geriatric syndrome with high prevalence and it is associated to mortality.^{1,23} However, these studies have presented results from the general elderly population that lived in the community.

In regard to graphics that addressed functional capacity, it was observed that the lower the functional capacity of the elderly person, the higher the mortality rate. However, important differences in the levels of dependence between scales that assess ADLs and IADLs and their relationship with mortality were identified. The participants who survived had an average in Barthel Index score of 78.2 in 2019, considered minimally dependent. The participants who died had an average of 47 on the ADL scale, considered moderately dependent.

In what regards IADLs, elderly people who survived had an average score of 19.7, considered moderately dependent. Those who died had an average of 13.2 ADLs in 2019, classified as severely dependent. These results are consistent with other studies that have shown that lower functional capacity is associated with higher mortality.²⁶⁻²⁷

The negative evolution of those with functional dependence can be explained by the fact that these individuals experienced significant decompensation when exposed to stressors, which can lead to death or a worsening of functional capacity. Thus, frailty and functional decline instruments can be used to predict prognosis in elderly patients, indicating measures or actions that can be taken in the care of this population.⁹ Early assessment of frailty can even prevent the occurrence of functional disability, as well as mortality.²⁸

Health professionals, especially those working in PHC, can contribute considerably significantly to the prevention of health problems in older adults through actions aimed at maintaining functional capacity and autonomy, avoiding frailty as much as possible and thus promoting a better quality of life for this population.²⁹

The number of participants in Phase 2 sample was considered a limitation of the study. This reduction may be related to the characteristics of the study population: older elderly people, with a significant percentage of deaths, especially in the context of the pandemic, and affected by chronic health conditions, in addition to migration, often to the homes of relatives, which made locating them difficult.

Another limitation was the difference in how data was collected between the phases of the study. In Phase 1, samples were collected through home visits, while in Phase 2, they were mostly collected by telephone, given the exceptional moment that COVID-19 brought to the entire population.

The sample studied is specific and still relatively unexplored. When researching this topic in the literature, the findings focused on hospital care were mainly found. Therefore, research on this topic is relevant for the development of person-centered interventions and care. Furthermore, these studies are important for obtaining a situational health diagnosis and identifying those who are most vulnerable and their care needs, with a view to preventing complications and maintaining, as much as possible, the functional capacity and autonomy of individuals.

Conclusion

Elderly people who were more frail, as assessed by the Edmonton Frail Scale, and the elderly with a lower functional capacity, as assessed by the Barthel Index and the Lawton Scale in HC1, showed higher mortality rates during the period of the research. New researches are necessary to study this specific population in HC.

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Editor in Chief: Cristiane Cardoso de Paula

Associate Editor: Rhanna Emanuelia Fontenele Lima de Carvalho

How to cite this article

Brito DT, Eberhardt ES, Tavares DMS, Rosset I. Mortality of elderly people in home care according to frailty and functional capacity. *Rev. Enferm. UFSM*. 2025 [Access at: Year Month Day]; vol.15, e38:1-14. DOI: <https://doi.org/10.5902/2179769290936>