

Short Communication

Home care in the Federal District: factors associated with the first occurrence of acute lower respiratory infection and death

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Abstract

Introduction: We aimed to evaluate the frequency and associated factors of acute respiratory infection and death among home care patients in Sobradinho/DF, Brazil. **Methods:** Data were obtained from patients' medical records. Bivariate and multivariate analyses were performed. Odds ratio and 95% confidence interval were estimated. **Results:** Factors associated with respiratory infection were ages <40 and >80 years and accommodation. Female sex was a protective factor. Age >30 years and dependency for daily activities were associated with death. **Conclusions:** These factors can improve clinical results in this specific home care and open new opportunities and questions for future research.

Keywords: Home care services. Communicable diseases. Health services for the aged.

Home care encompasses actions ranging from promotion of health; disease prevention, treatment, and rehabilitation; until palliative care¹. Health actions are carried out in the patient's home by a multi-professional team trained for this purpose as well as the patient and his/her family², with doctors and nurses being obligatory members of the team³.

In the 1980s, the discussion about caring for elderly patients with non-communicable chronic diseases within the public health system of the Federal District [*Distrito Federal* (DF)], Brazil, was intensified. The situation was overburdening hospital services, not only due to the complexity of assistance needed, but also due to the longer hospital stay, posing a risk for hospital infections⁴. In 1994, the Regional Health Authority (NRAD/RSS) in Sobradinho/DF, established a Home Care Public Program. Patients with non-communicable diseases with comorbidities who needed services beyond those provided by primary care centers attended the program. For example, patients with a disease that has gone beyond the curative possibilities or those with a moderate to serious level of functional dependency in activities of daily living (ADL)⁵.

From 2003 to 2010, 973 patients attended the program, of whom 750 (77%) were >60 years old. Among the elderly

patients, 306 (41%) presented with a secondary diagnosis of infectious disease (ID) during their assistance in the program⁶. The accurate diagnosis of IDs is of great clinical importance, especially in elderly patients receiving home care as well as in institutions providing home care. IDs account for 1/3 of the mortality in individuals aged >65 years^{7,8}.

An analytical cross-sectional study was conducted to estimate the frequency of the first occurrence of acute lower respiratory infection and death – independently of the its basic cause – and its associated factors in patients who attended the Home Care Public Program of the Regional Health Authority in Sobradinho (NRAD/RSS) in the DF, Brazil, to subsidize health authorities and improve clinical results.

The definition of first occurrence of acute lower respiratory infection case was of an infection not acquired during hospitalization. This infection was diagnosed based on the patients' clinical or laboratory records and appeared at least 30 days after the patient attended the program. In the program, the medical professional makes a diagnosis considering the patient's clinical state: presence of fever, changes in patient's general condition, reduced appetite, appearance or worsening of findings upon pulmonary auscultation, mental confusion without neurological disease, and presence of alterations in the leucogram.

Data were obtained from the patients' medical records. The study was conducted in the administrative region of Sobradinho. The study involved 973 patients who were admitted to Home

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Care from June 1, 2003 to June 30, 2010. As an assumption of the study, the first admission of each patient was considered. This information was not used for patients whose records were not found in the files or in patients whose medical records contained unclear data. Data regarding patient's admission to the program was obtained by a single observer using a standardized questionnaire.

For the respiratory infection outcome the total number of patients (973) was studied. Regarding factors associated with death, patients who died or were discharged from the program after a clinical improvement (control group) were studied, a total of 730 patients, after excluding patients who were still being actively monitored by the program at the time of the study.

The frequencies of the following variables were obtained and calculated: 1) from the individual: age, sex, and level of functional incapacity for activities of daily living (ADL), measured during the admission on the program and using the scale validated by the Spanish Red Cross⁹; 2) from the environment: water treatment (water supplied by the public network or by other informal sources) and household waste and sewage disposal methods (both public collection and other informal destinations); 3) from the residence: presence of domestic animals and patient's type of accommodation (individual or shared room). The Spanish Red Cross scale was used to classify the patient's level of dependency, ranging from Level 0 (independence for ADL) to Level 5 (total dependency for ADL). To classify the dependency for ADL in the analyses, the following categories were adopted: non-dependent patient (Levels 0, 1, and 2) and dependent patient (Levels 3, 4, and 5).

A bivariate analysis was conducted to evaluate the association between studied variables and patient outcomes. A multivariate binary logistic regression model was constructed. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were used to measure the association between variables. The binary logistic regression model adopted the method of sequential entry controlled by the researcher using the following criteria: a) category of the variable presented in three levels in the following order: characteristics of individuals, residence, and environmental control services for water, sewage, and household waste; and b) probability of the association – the variables were applied in the multivariate model when they presented a statistical association with patient outcomes ($p \leq 0.15$) in the bivariate analysis. After analyzing each level, variables with a p -value ≥ 0.20 were removed after fitting to continue the analysis. The variables that had a statistical association with the outcome remained in the model, having a p -value ≤ 0.05 . Stratified analyses were performed to estimate the existence of interactions between the variables that, in the multivariate analysis, continued to be associated with the outcome at a p -value ≤ 0.05 . The goodness of fit in the multivariate analyses was analyzed using the Hosmer-Lemeshow test. Statistical analyses were performed at a 5% significance level.

Ethical considerations

The study was approved by the Committee for Ethics in Research of the Foundation for Teaching and Research in Health Sciences, State Health Secretariat (N^o 0040, November 8, 2010).

Of the 973 patients, 111 experienced the first occurrence of acute lower respiratory infection. To estimate the association between ages and presence of the first occurrence of acute lower respiratory infection, patients were categorized into the following three age groups: ≤ 40 years old, 41-80 years old, and ≥ 81 years old.

The 41-80-year age group was considered as the reference category, with the lowest frequency of the first occurrence of acute lower respiratory infection based on the data description. The two remaining age groups were significantly associated with the presence of the first occurrence of acute lower respiratory infection, with ORs of 3.15 (95% CI=1.83-5.45 and $p < 0.001$) and 1.87 (95% CI=1.20-2.83 and $p = 0.005$) for age groups ≤ 40 years and ≥ 80 years, respectively (**Table 1**).

Other associated factors were shared accommodation (OR=2.32; 95% CI=1.56-2.47; $p < 0.001$) and waste collection using sources other than the public network (OR=2.95; 95% CI=1.39-6.25; $p = 0.003$). Being female was a protective factor against acute lower respiratory infection (OR=0.25; 95% CI=0.16-0.39; $p < 0.001$).

In the logistic regression model, the following exposures were significantly associated with the first occurrence of acute lower respiratory infection: ages < 40 years or > 80 years (OR=1.97; 95% CI=1.29-3.00; $p = 0.002$), shared accommodation (OR=2.40; 95% CI=1.56-3.68; $p < 0.001$), and being female, as a protective factor (OR= 0.23; 95% CI=0.14-0.36; $p < 0.001$) (**Table 1**).

In the final model, the same variables remained associated with the first occurrence of acute lower respiratory infection (**Table 2**).

In the bivariate analysis of death, patients were categorized into three age groups: up to 30 years, 31-59 years, and ≥ 60 years. The up to 30 year age group was considered as the reference category. The 31-59 year and ≥ 60 year age groups were significantly associated with death. Being male and having a greater degree of functional dependence (ADL= 3,4, and 5) were also associated with death. Protective factors were shared accommodation and sewage disposal system outside the public network (**Table 3**).

In the multivariate analysis, the factors significantly associated with death were as follows: age ≥ 30 years, male sex, and greater degree of functional dependency. Shared accommodation was a protective factor (**Table 3**). In the final multivariable model, the factors significantly associated with death were age ≥ 30 years and greater degree of functional dependency (**Table 2**).

The products of interactions between the variables present in the final models were not introduced in the logistic regression analysis (homogeneity test non-significant at a p -value of 0.15).

This study describes some factors associated with the first occurrence of acute lower respiratory infection within the context of this health assistance modality. Notably, it is uncommon in Brazil to incorporate practices in home care services to prevent and control infections. There were only a

TABLE 1: Results of bivariate and multivariate analyses on the outcome of the first occurrence of acute lower respiratory infection, based on the characteristics of the individual, residence and environmental control services (Sobradinho-DF, June 2003 to June 2010).

Variables	Respiratory infection		Odds ratio	95% CI	p-value	ORadj*	95% CI	p-value
	with	without						
Characteristics of the individual								
Age stratum (years)								
≤ 40	24	88	3.15	1.83–5.45	0.001			
41 to 80	44	509	1					
> 81	43	265	1.87	1.20–2.93	0.005	1.97**	1.29–3.00	0.002
Sex								
female	31	523	0.25	0.16–0.39	<0.001	0.23	0.14–0.36	<0.001
male	80	339	1					
Level of dependency (ADL)								
dependent patient	96	706	1.41	0.80–2.50	0.232			
non-dependent patient	15	156	1					
Characteristics of residence								
Accommodation								
shared room	55	256	2.32	1.56–3.47	<0.001	2.40	1.56–3.68	<0.001
individual room	56	606	1					
Animals in the residence								
presence	71	470	1.48	0.98–2.23	0.060	1.33	0.85–2.07	0.210
absence	40	392	1					
Environmental control services								
Water treatment								
other sources	32	221	1.18	0.76–1.82	0.471			
public network	79	641	1					
Disposal of sewage								
other destinations	36	222	1.38	0.90–2.12	0.134	1.23	0.75–2.01	0.415
public collection	75	640	1					
Disposal of household waste								
other destinations	10	28	2.95	1.39–6.25	0.003	1.55	0.63–3.79	0.339
public collection	101	834	1					

95% CI: confidence interval 95%; **ORadj:** adjusted odds ratio; **ADL:** activities of daily living; *Goodness of fit of model – Hosmer-Lemeshow test (p=0.195). **For the multivariate analysis, the two high-risk age groups were merged. **Source:** Home Care Regional Nucleus/Sobradinho/DF.

few national studies that used this modality to determine the risk factors for infections¹⁰. The results of the study showed that being female was a protective factor for acute lower respiratory infection in patients under home care. In 2007, 733,209 patients in Brazil were hospitalized due to pneumonia, according to the Hospital Information System of SUS Hospital Information System of SUS. Majority of these patients were men¹¹. This appears to be a worldwide tendency.

The fact that 11.41% of patients from this study presented a diagnosis of acute lower respiratory infection while they were on the program shows the importance of early identification of symptoms. Infectious diseases that affect the respiratory system are particularly worrying in elderly patients (aged >60 years) and are among the leading cause of admission. This group is the most susceptible to influenza and pneumonia that can lead to death¹². It should be emphasized that a shared accommodation

TABLE 2: Final logistic regression model of the multivariate analysis of studied outcomes based on the characteristics of the individual and residence (Sobradinho, DF, June 2003 to June 2010).

Outcomes/variables	β	SE	ORadj*	95% CI	p-value
Respiratory infection					
Age (years)					
≤40 and <80	0.684	0.216	1.98	1.30–3.02	0.002
Sex					
female	-1.506	0.229	0.22	0.14–0.35	<0.001
Accommodation					
shared room	0.909	0.217	2.48	1.62–3.79	<0.001
Death					
Age (years)					
>31	1.440	0.355	4.22	2.11–8.46	<0.001
Level of functional dependency (ADL)					
dependent	1.420	0.224	4.14	2.67–6.42	<0.001

β : regression coefficient; SE: standard error; ORadj: adjusted odds ratio; 95% CI: confidence interval 95%; ADL: activities of daily living. *Goodness of fit of model – Hosmer-Lemeshow test (p=0.734). Source: Home Care Regional Nucleus/Sobradinho/DF.

constitutes a risk factor due to the agglomeration of people in the same environment, in a low socio-economic groups. Acute respiratory diseases are potentially preventable by home care, for example, an individual room must be provided; the environment should be kept clean and well ventilated; the patient should not remain completely immobile in bed to prevent the accumulation of secretions in the upper respiratory tract; and attention should be paid to factors associated with infection¹³.

A greater degree of functional dependence was a factor that was independently associated with death, indicating a possible relationship between basic non-communicable diseases, loss of autonomy, and death. Regarding dying at home, according to a report from the World Health Organization, home is a place of emotional and physical associations, memories, and comfort¹⁴. Dying at home is sometimes recommended by professionals who work in home care facilities. Whenever feasible, with a guarantee that the patient will receive a good assistance at home, this alternative is suggested to family members, because this is a more dignified death, even if suffering is involved in the process of becoming ill.

This study had some limitations. Precluding the generalizability of the results are the absence of diagnosis by imaging to confirm the presence of a respiratory infection and the collection of secondary data from patients' medical records; furthermore, it was impossible to analyze the association between respiratory infection and vaccination against influenza,

as this information was not available in the patients' records. One also has to consider the absence of data from other episodes of acute lower respiratory infection in individuals who had the first diagnosis of the disease and the lack of a description of the time elapsed between the patient's admission and the diagnosis of infection. Moreover, it should be emphasized that the study of comorbidities, which can act as risk factors for acute lower respiratory infection and death, was not the objective of this study, which also constitutes a limitation on the data. It is hypothesized that some of the factors associated with acute lower respiratory infection and death, in the multivariate models, may have been affected by the confounding effect of unstudied variables, such as socioeconomic, nutritional factors, use of medical equipment and procedures, presence of comorbidities, and other characteristics related to the caregiver.

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Conflict of interest

The authors declare that there is no conflict of interest.

TABLE 3: Results of the bivariate and multivariate analyses of death, according to characteristics of the individual, residence, and environmental control services (Sobradinho, DF, June 2003 to June 2010).

Variables	Death	Dis- charged	Odds ratio	95% CI	p-value	ORadj*	95% CI	p-value
Characteristics of the individual								
Age stratum (years)								
≤ 30	12	32	1					
31 to 59	57	54	2.81	1.31–6.02	0.007			
>60	362	213	4.53	2.28–8.99	<0.001	3.72**	1.81–7.65	<0.001
Sex								
male	203	120	1.33	0.98-1.79	0.062	1.28	0.93–1.75	0.131
female	228	179	1					
Level of dependency (ADL)								
dependent patient	397	221	4.12	2.67–6.37	<0.001	4.02	2.58–6.25	<0.001
non-dependent patient	34	78	1					
Characteristics of residence								
Accommodation								
shared room	135	121	0.67	0.49–0.91	0.011	0.80	0.58–1.12	0.190
individual room	296	178	1					
Animals in the residence								
presence	243	178	0.88	0.65–1.18	0.397			
absence	188	121	1					
Environmental control services								
Water treatment								
other sources	99	83	0.78	0.55–1.09	0.141	1.52	0.26–8.73	0.639
public network	332	216	1					
Disposal of sewage								
other destinations	100	87	0.74	0.53–1.03	0.073	0.54	0.09–3.08	0.489
public collection	331	212	1					
Disposal of household waste								
other destinations	20	12	1.16	0.56–2.42	0.684			
public collection	441	287	1					

95% CI: confidence interval 95%; **ORadj:** adjusted odds ratio; **ADL:** activities of daily living. *Goodness of fit of model – Hosmer-Lemeshow test ($p=0.672$). **In the multivariable analysis, the two high-risk age groups were merged. **Source:** Home Care Regional Nucleus/Sobradinho/DF.

REFERENCES

- Lacerda MR, Giacomozzi CM, Oliniski SR, Truppel TC. Atenção à saúde no domicílio: modalidades que fundamentam sua prática. *Saude Soc.* 2006;15(2):88-95.
- Duarte YAO, Diogo MJE. Atendimento domiciliário: um enfoque gerontológico. São Paulo: Atheneu; 2000. p. 49-70.
- Ministério da Saúde (MS). Portaria 2.527 - Redefine a Atenção Domiciliar no âmbito do Sistema Único de Saúde (SUS). Brasília: MS; 2011.
- Mendes EV. As redes de atenção à saúde. Brasília: Organização Pan Americana da Saúde; 2ª. ed. 2011. 550p.
- Governo do Distrito Federal (GDF). Secretaria de Estado de Saúde do Distrito Federal. Programa de Internação Domiciliar. Brasília: GDF; 2008. 34p.
- Barros LN. Atenção domiciliar da regional de saúde de Sobradinho/DF: perfil clínico-epidemiológico de pacientes, análise de sobrevivência e fatores associados com doença infecciosa e óbito, no período de 2003 a 2010. [Master's Thesis]. Brasília (DF): Universidade de Brasília; 2012. 131p.

7. Werner H, Kuntsche J. Infection in the elderly-What is different? *Z Gerontol Geriatr.* 2000;33(5):350-56.
8. Mouton CP, Bazaldua OV, Pierce B, Espino DV. Common infections in older adults. *Am Fam Physician.* 2001;63(2):257-68.
9. Gaspar JC, Oliveira MAC, Duayer MFF. Perfil dos pacientes com perdas funcionais e dependência atendidos pelo PSF no município de São Paulo. *Rev Esc Enferm USP.* 2007;41(4):619-28.
10. Valle ARMC, Andrade D. Habilidades e atitudes do enfermeiro na atenção domiciliar: bases para a prevenção dos riscos de infecção. *Rev Min Enferm.* 2015;19(2):67-72.
11. Ministério da Saúde (MS). DATASUS. Informações de Saúde. Brasília: MS; citado em: 17 de março de 2012. Disponível em: <http://w3.datasus.gov.br/datasus/datasus.php?area=359A1B0C0D0E0F359G3H011Jd1L2M0N&VInclude=../site/texto.php>. 2012.
12. Toscano CM, Oliveira WK, Carmo EH. Morbidade e mortalidade por doenças transmissíveis no Brasil. *In: Ministério da Saúde (MS). Saúde Brasil 2009: uma análise da situação de saúde e da agenda nacional e internacional de prioridades em saúde.* Brasília: MS; 2010. p. 73-109.
13. Valle ARMC. Competências do enfermeiro para ações preventivas na atenção domiciliar com ênfase nos riscos de infecções. [Doctor's Thesis]. Ribeirão Preto (SP): Universidade de São Paulo; 2013. 261p.
14. Tarricone R, Tsouros AD. Home care in Europe: the solid facts. Copenhagen: World Health Organization; 2008. p. vii.