Mortality and characteristics of older people dying with COVID-19 in Lombardy nursing homes, Italy: An observational cohort study

Chiara Arienti[1], Lorenzo Brambilla[1], Silvia Campagnini[2,3], Chiara Fanciullacci[2], Fabrizio Giunco[1], Andrea Mannini[2,3], Michele Patrini[1], Federica Tartarone[1], Maria Chiara Carrozza[1,3]

[1]IRCCS Fondazione Don Carlo Gnocchi, Milan, Italy, [2]IRCCS Fondazione Don Carlo Gnocchi, Florence, Italy, [3]The BioRobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy

Background: The aim of the study was to describe the epidemiological characteristics of Nursing Homes (NHs) residents infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and to compute the related case-fatality rate. **Materials and Methods:** The outcomes were mortality and case-fatality rate with related epidemiological characteristics (age, sex, comorbidity, and frailty). **Results:** During the COVID-19 outbreak lasted from March 1 to May 7, 2020, 330 residents died in Fondazione Don Gnocchi NHs bringing the mortality rate to 27% with a dramatic increase compared to the same period of 2019, when it was 7.5%. Naso/oropharyngeal swabs resulted positive for COVID-19 in 315 (71%) of the 441 of the symptomatic/exposed residents tested. The COVID-19 population was 75% female, with a 17% overall fatality rate and sex-specific fatality rates of 19% and 13% for females and males, respectively. Fifty-six percent of deaths presented SARS-CoV-2-associated pneumonia, 15% cardiovascular, and 29% miscellaneous pathologies. **Conclusion:** Patients' complexity and frailty might influence SARS-CoV-2 infection case-fatality rate estimates. A COVID-19 register is needed to study COVID-19 frail patients' epidemiology and characteristics.

Key words: COVID-19, epidemiology, frail elderly, mortality, nursing homes

INTRODUCTION

On February 20th, the first severe case of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pneumonia was diagnosed in Lombardy region, northern Italy. Within 14 days, the epidemic spread across Lombardy, with a substantial number of critically ill patients.[1] It was the beginning of a large cluster of COVID-19 with more than 84,844 cases and 27,430 deaths up to May 2020.[2] Despite the containment measures issued by national and local governments, the number of infected continued to rise.[3] This, along with the well-recognized Nursing Homes (NHs) residents' frailty and vulnerability to respiratory diseases outbreaks,[4] has led to a very high COVID-19 case-fatality rate in frail old populations.[5] The high impact that COVID-19 had in this setting is even more evident comparing yearly mortality rates reported by previously conducted studies, which ranged between 14.4% and 22.4%,[6,7] and the rates reported by recent literature: 32% and up to 43% in residents aged 90 years and older.[8]

On March 24, 2020, the Istituto Superiore di Sanità launched a survey to monitor the situation and devise plans for health-care-associated infection control and prevention. This report focuses on the six Lombardy-based Fondazione Don Carlo Gnocchi Nursing Homes (FDG-NHs) to investigate causes and origins of the COVID-19 outbreak negative effects in Lombardy NHs.[9] The aim is to provide an epidemiological description of FDG-NHs

COVID-19-infected residents' cohort and compute the disease case-rate fatality.

METHODS

Study design and setting
An observational analytic cohort study[10] was conducted in Lombardy-based FDG-NHs residents infected by SARS-CoV-2, addressing the period March 1–May 7, 2020. The reporting of this study conforms to the STROBE guidelines [Supplementary File – STROBE checklist].

FDG is a nonprofit foundation dedicated to rehabilitation and assistance of frail people. FDG includes two scientific research hospitals, 14 rehabilitation centers, 3 hospices, 1 residential care, and 8 NHs, 6 (75%) of which located in Lombardy.

Population
From the beginning of the outbreak, FDG-NHs activated a surveillance to identify SARS-CoV-2 infection cases and provided guidance on isolation, quarantine, and testing for symptomatic close contacts of their residents. The first COVID-19 case was a 75-year-old woman presenting with cough, fever, and dyspnea. She was diagnosed on March 16th after positive naso/oropharyngeal swab results and died 6 days later from SARS-CoV-2 severe pneumonia. All FDG-NHs COVID-19-affected residents were included in the study; information on symptoms, frailty, severity, and comorbidities was collected.

Outcome measures
Patients' frailty was measured with Scheda di osservazione intermedia dell'assistenza (SOSIA), an intermediate observation of assistance form used in Lombardy. Residents are classified into eight isofrailty classes (high frailty = 1 and no frailty = 8), according to motor and cognitive skills impairment and the presence of comorbidities.[11] Overall mortality and case-fatality ratio – associated with epidemiological characteristics in terms of age, sex, comorbidity, frailty levels, and death cause – were computed.

Statistical analysis
Descriptive statistics was used to analyze categorical variables in size and percentage (absolute and relative frequencies). To reduce any potential source of bias, data were collected from anonymized medical histories by a researcher blinded to the aims of the study.

RESULTS

On February 29, 2020, there were 1234 residents in Lombardy-based FDG-NHs with a mean age of
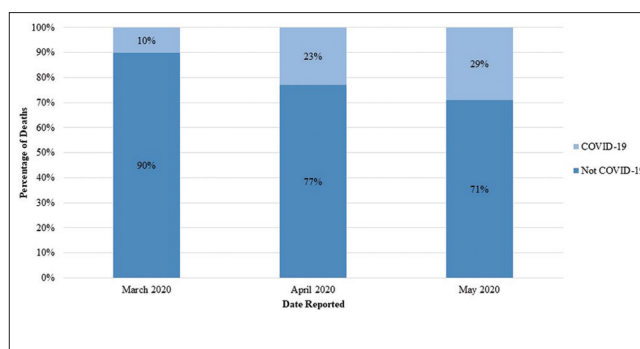

Figure 1: Fondazione Don Carlo Gnocchi Nursing Homes fatality rate confirmed cases of COVID-19

85 ± 9.89 years, 947 (77%) females and 287 (23%) males. The mortality rate during the COVID-19 outbreak occurred between March 1 and May 7, 2020 was 27% (330 deaths) marking a drastic increase compared to the same period of the previous year, when it was 7.5%. During that period, 441 (36%) naso/oropharyngeal swabs were performed on either symptomatic or exposed residents. Three hundred and fifteen (71%) were confirmed as COVID-19 cases, 188 (60%) symptomatic and 127 (40%) asymptomatic. The COVID-19 population was 85 ± 8.74 years old and 75% female (237). Of the total 55 deaths within this cohort, 56% (31) presented SARS-CoV-2-associated pneumonia, 15% (8) cardiovascular diseases, and 29% (16) miscellaneous pathologies. The residents who died with COVID-19 had an average age of 87 ± 6.93 years, with a fatality rate of 17% (55 deaths/315 individuals). Females, with high frailty level (SOSIA level between 1 and 3 scores), represented 73% (40/55) of all the deaths, with a sex-specific fatality rate of 19% (45/237), while males' fatality was 13% (10/78).

DISCUSSION

Our results show that the deceased residents were very old, females, with high frailty level, and many comorbidities. Findings on the impact of COVID-19 in NHs are still scarce, not allowing to draw widely generalizable conclusions, but the case-fatality rate in FDG-NHs appeared lower compared with similar setting in other countries.[12] Recent evidence confirms this[13,14] and highlights the challenge of containing the epidemic in vulnerable NHs populations.[15] Furthermore, our findings highlight that COVID-19 case-fatality rate might be influenced by patients' complexity and frailty. The exact number of people who died directly from severe pneumonia caused by SARS-CoV-2 or indirectly from infection consequences is still unknown.[16] A National COVID-19 Register is urgently needed to study epidemiological and clinical characteristics of COVID-19 frail patients to develop prognostic models on infection and mortality risk, disease progression, and length of hospitalization.

The main limitation of the study was the emergency situation that constrained data collection impeding to perform additional analysis.

CONCLUSION

The COVID-19 outbreak, with its high human cost, highlights the need of robust systems for dealing with emergencies. A standardized monitoring of the disease transmission is necessary to structure a solid epidemiological description useful to inform public health action. The National COVID-19 register aims to lay the foundations for a shared close observation of the problem.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Odone A, Delmonte D, Scognamiglio T, Signorelli C. COVID-19 deaths in Lombardy, Italy: data in context. Lancet Public Health 2020;5:e310.
2. 'COVID-19-Italy'. Available from: http://opendatadpc.maps.arcgis.com/apps/opsdashboard/index.html#/b0c68bce2cce478eaac82fe38d4138b1. [Last accessed on 2020 Jun 17].
3. Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in Lombardy, Italy: Early experience and forecast during an emergency response. JAMA 2020;323:1545-6.
4. Lansbury LE, Brown CS, Nguyen-Van-Tam JS. Influenza in long-term care facilities. Influenza Other Respir Viruses 2017;11:356-66.
5. Livingston E, Bucher K. Coronavirus disease 2019 (COVID-19) in Italy. JAMA 2020;323:1335.
6. Vossius C, Selbæk G, Šaltytė Benth J, Bergh S. Mortality in nursing home residents: A longitudinal study over three years. PLoS One 2018;13:e0203480.
7. Reilev M, Lundby C, Jensen J, Larsen SP, Hoffmann H, Pottegård A. Morbidity and mortality among older people admitted to nursing home. Age Ageing 2019;49:67-73.
8. Down A, Dhillon A, Stretch G. COVID-19 in Care Homes: Atypical Presentations and High Mortality Rates Mean Outbreak Management Needs to Include Health and Social Care-Early Identification of Atypical Clinical Signs, and Complete Segregation of Cases, Not Cohorting, Is Essential; June, 2020. [doi: 10.20944/preprints202006.0060.v1].
9. Trabucchi M, De Leo D. Nursing homes or besieged castles: COVID-19 in northern Italy. Lancet Psychiatry 2020;7:387-8.
10. Grimes DA, Schulz KF. An overview of clinical research: The lay of the land. Lancet 2002;359:57-61.
11. Dotti C, Casale G, Zacchi V, Lovaglio P, Fazzone U. SOSIA classification of the frail elderly in nursing homes of region of Lombardy. Ann Ig 2006;18:439-51.
12. McMichael TM, Currie DW, Clark S, Pogosjans S, Kay M, Schwartz NG, *et al*. Epidemiology of Covid-19 in a long-term care facility in king county, Washington. N Engl J Med 2020;382:2005-11.
13. Hsu AT, Lane N, Sinha SK, Dunning J, Dhuper M, Kahiel Z, *et al.* Report: Understanding the Impact of COVID-19 on Residents of Canada's Long-Term Care Homes – Ongoing Challenges and Policy Responses. Article in LTCcovid.org, International Long-Term Care Policy Network, CPEC-LSE; June 04, 2020.
14. 'COVID-19 Nursing Home Data'. Available from: https://data.cms.gov/stories/s/COVID-19-Nursing-Home-Data/bkwz-xpvg/. [Last accessed on 2020 Jul 08].
15. Béland D, Marier P. COVID-19 and long-term care policy for older people in Canada. J Aging Soc Policy 2020;32:358-64.
16. Piccininni M, Rohmann JL, Foresti L, Lurani C, Kurth T. Use of all cause mortality to quantify the consequences of covid-19 in Nembro, Lombardy: descriptive study. BMJ 2020;369:m1835.