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Mapping the COVID-19 epidemic in Lombardy, Italy, years 2020-2022: a population-based study of temporal trends, geographic distribution, and risk factors for incidence, hospitalization, and mortality

Simone Villa; Pietro Magnoni; Cristina Mazzali; Alberto Zucchi; Giovanni Maifredi; Luca Cavalieri d'Oro; Maria Letizia Gambino; Anna Clara Fanetti; Pietro Giovanni Perotti; Marco Villa; Maria Grazia Valsecchi; Daria Vigani; Claudio Lucifora; Fabrizio Ernesto Pregliasco; Danilo Cereda; Olivia Leoni; Antonio Giampiero Russo

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PROGETTO

"The Post-Covid-19 Syndrome: network building and innovative management to address a new public health emergency"

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Mapping the COVID-19 epidemic in Lombardy, Italy, years 2020-2022: a population-based study of temporal trends, geographic distribution, and risk factors for incidence, hospitalization, and mortality

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ABSTRACT

Background

In late winter of 2020, the first locally transmitted outbreak of COVID-19 in Europe was reported in Lombardy, Italy. This study provides a comprehensive analysis of the epidemic's trajectory in this heavily impacted region from March 2020 to the end of 2022.

Methods

We conducted a cohort study utilizing anonymized data from Lombardy's eight local public health authorities (LPHAs). The dataset included all individuals registered with the Regional Health Service as of January 2020, with monthly data aggregated by sex, age, country of origin, municipality or ZIP area, and comorbidities. SARS-CoV-2 lineage data from the regional repository allowed us to segment the study period into four sub-periods by predominant viral lineages. We report the temporal trends and geographical distribution of three outcomes (COVID-19 incidence, hospital admissions, and mortality) as well as COVID-19 test positivity rates and vaccination coverage across LPHAs and Local Health Districts (LHDs). Multivariable regression models were employed to identify key risk factors for COVID-19 incidence and mortality in each of the four sub-periods.

Results

We describe the impact of the COVID-19 pandemic over a population of 10 million people, 45% of which with ≥50 years of age and 22% prevalence of cardiac diseases.

Although the outbreak was concentrated, in the early phases, in a few LHDs, none of which with big cities, as soon as the SARS-CoV-2 transmission increased in the population hospital admission and mortality decreased over time, especially for areas early impacted.

Our results confirm the role of age and neurologic and renal comorbidities, as well as geographical location, hinting at the impact of local epidemic dynamics and health system factors on both outcomes.

Conclusions

Our findings provide essential insights into the dynamics of COVID-19 in one of Europe's earliest and most severely affected regions, contributing valuable evidence to the global understanding of pandemic management and public health responses.