Circulation

RESEARCH LETTER

Population Trends in Rates of Percutaneous Coronary Revascularization for Acute Coronary Syndromes Associated With the COVID-19 Outbreak

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A reduction in hospital admissions for acute coronary syndromes (ACS) has been observed globally in the aftermath of the pneumonia outbreak caused by coronavirus disease 2019 (COVID-19).[1] Despite the emergence of anecdotal reports, formal evaluation of the variation in percutaneous coronary intervention (PCI) rates during the COVID-19 outbreak has not yet been reported. Italy is one of the countries most heavily affected by the COVID-19 pandemic with 168 941 confirmed cases and 22 170 deaths as of April 5, 2020.

We investigated the association between the outbreak of COVID-19 and PCI rates for ACS in the Campania region, which, with 5.8 million residents, represents ≈10% of the Italian population. Data were obtained from 20 of 21 PCI centers over an 8-week period, including 4 weeks before and 4 weeks after the COVID-19 outbreak corresponding with the first reported case declared by the Civil Protection Department on February 27, 2020. Incidence rates and their ratios were calculated by using Poisson regression analysis, and interactions for sex and age were estimated by adding the interaction term to the regression models.[2] Population denominators, which were used as offset, were obtained from the Italian census. The ratio change in PCI rates for the entire 8-week interval was estimated by adding a linear term to the Poisson regression. The study was approved by the Ethics Committee of the University of Naples Federico II (Naples, Italy).

From January 30, 2020, to March 26, 2020, a total of 1831 PCIs were performed in the Campania region; of them, 738 (40.31%) were elective PCIs (not included), 604 (32.99%) were PCIs for non–ST-segment–elevation acute ACS, and 489 (26.71%) were PCIs for ST-segment–elevation myocardial infarction (STEMI). Mean age was 65.7 years (SD, 12), and 804 of 1093 PCIs (73.56%) were performed in men. There were no differences in mean age (65.8±11.8 versus 65.6±12.2 years, P=0.78) and the proportion of men (72% versus 75%, P=0.29) in the 4 weeks before the COVID-19 outbreak in comparison with the subsequent 4 weeks.

The incidence rate of PCI for ACS decreased from 178 to 120 cases per 100 000 residents per year during the 4-week period before in comparison with after the COVID-19 outbreak (Figure). The incidence rate ratio (IRR) was 0.68. The reduction was similar for both non–ST-segment–elevation ACS and STEMI (from 98 to 66 and from 80 to 54 PCI cases per 100 000 residents per year, respectively). The decrease in PCIs for ACS was more evident in women (IRR, 0.60) than in men (IRR, 0.70), resulting in a significant interaction (P<0.001). There was heterogeneity (P-interaction <0.001) in the decline of PCI rates across age categories, with patients <55 years of age less affected by the reduction (IRR, 0.75). Findings were consistent between PCI centers in the metropolitan (IRR, 0.72) versus nonmetropolitan areas (IRR, 0.62). Over the interval from week −4 to week +4, the ratio change in PCI rate was 0.51 (95% CI, 0.50–0.52) for ACS, 0.54 (95% CI, 0.53–0.56) for non–ST-segment–elevation acute ACS,

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Key Words: acute coronary syndrome ■ COVID-19 ■ epidemiology ■ percutaneous coronary intervention

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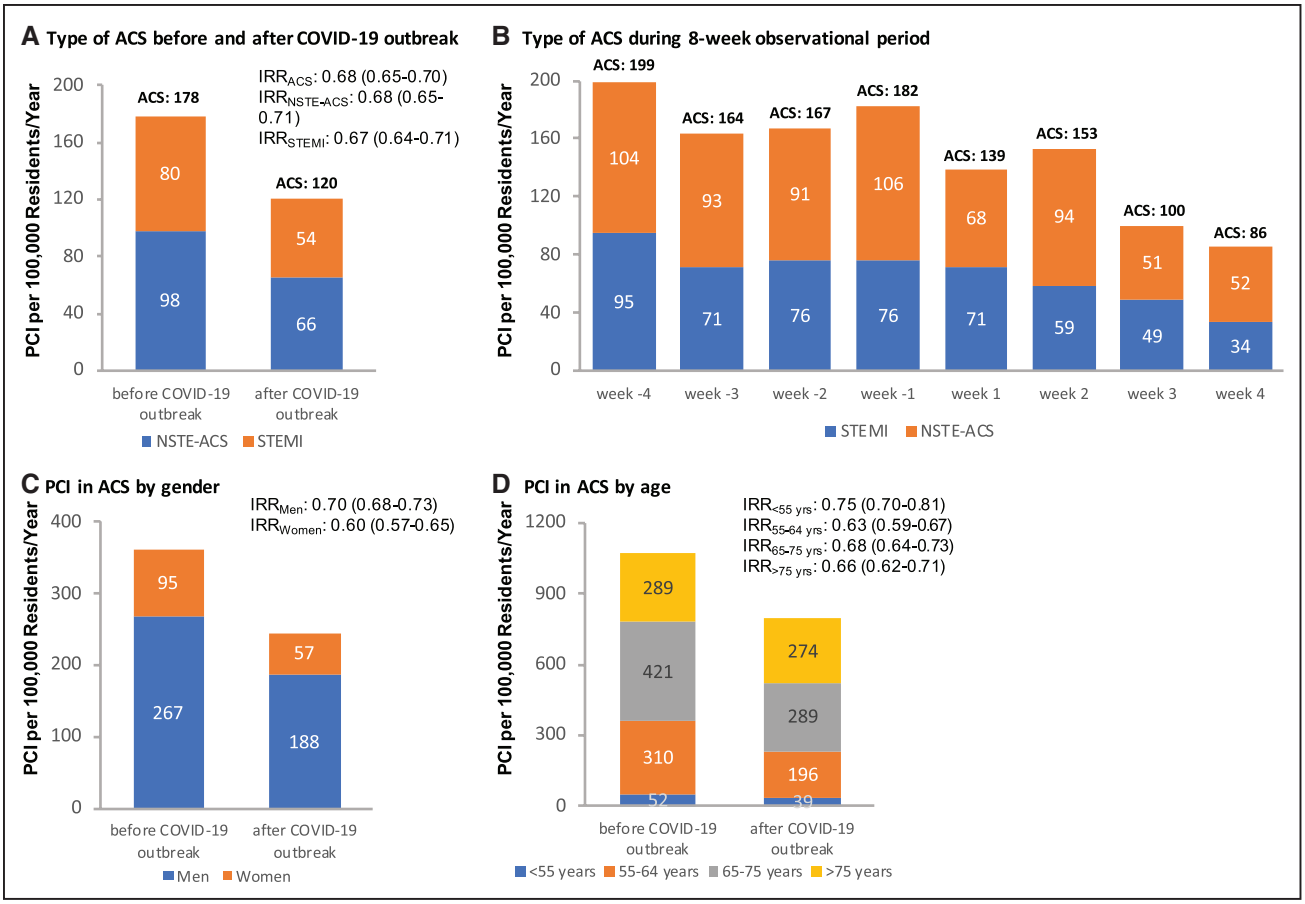

Figure. PCI incidence rates during before and after the COVID-19 outbreak in the Campania region, Italy.
A, Incidence rates before and after the first reported case of COVID-19 according to the type of ACS. Absolute numbers of PCI cases for ACS, NSTE-ACS, and STEMI were 652, 360, 292 and 441, 244, 197 in the 4 weeks before and the 4 weeks after the outbreak of COVID-19, respectively. In 2019, PCI volumes for the corresponding 4-week period after the outbreak of COVID-19 were 699, 392, 307 for ACS, NSTE-ACS, and STEMI, respectively. **B**, Incident rates by week according to the type of ACS. Weeks –4 to –1 represent the 4-week period before the first case of COVID-19 in the Campania region (February 27, 2020) and weeks 1 to 4 represent the 4-week period after the COVID-19 outbreak (data were collected until March 26, 2020). **C**, Incidence rates of PCI for ACS before and after the COVID-19 outbreak according to sex. **D**, Incidence rates of PCI for ACS before and after the COVID-19 outbreak according to age categories. ACS indicates acute coronary syndrome; COVID-19, coronavirus disease 2019; IRR, incidence rate ratio; NSTE-ACS, non–ST-segment–elevation ACS; PCI, percutaneous coronary intervention; and STEMI, ST-segment–elevation myocardial infarction.

and 0.47 (95% CI, 0.45–0.49) for STEMI (Figure). In comparison with the same period in 2019, PCI rates decreased from 190 to 120, from 107 to 66, and from 84 to 54 cases per 100 000 residents per year for ACS (IRR, 0.63), non–ST-segment–elevation acute ACS (IRR, 0.62), and STEMI (IRR, 0.64), respectively.

In the third most populous region of Italy, we found evidence that the outbreak of COVID-19 was associated with a decline by 32% in the number of PCIs for ACS. In the last 2 weeks of the observational period, PCIs for ACS were reduced by 50%. In comparison with PCI volumes for the same time in 2019, the decline in PCI rates was of a similar magnitude (between 36% and 38%).

Mechanisms underpinning this decrease are unknown, although several explanations might be involved. Chest pain might be underestimated or misestimated by patients because of the fear of exposure to COVID-19–affected subjects at hospital admission. This hypothesis might be supported by the stronger decline in PCI rates among women, in whom misdiagnosis and delayed revascularization are more likely to occur in an ACS setting.[3] Other explanations might be related to the unique situation of a country lockdown, potentially leading to less physical activity that might trigger an ACS, coupled with reduced air pollution.

Our data indicate that the COVID-19 outbreak was associated with a remarkable decrease in the rates of PCI across the entire spectrum of ACS. Although we did not measure the hospitalization rates for ACS, PCI represents the most common revascularization modality for patients who have ACS. The Campania region has been less affected than others by the COVID-19 pandemic and, as a result, no changes occurred during the study period in the regional hub-and-spoke care system and in the management of patients with ACS. Therefore, PCI rates effectively reflect ACS rates. However, we cannot determine to what extent the observed

 Circulation. 2020;141:2035–2037. DOI: 10.1161/CIRCULATIONAHA.120.047457

trends reflect changes in patient or physician behavior versus incident ACS.

The findings of this study might have important implications for healthcare systems and suggest that public campaigns aiming to increase awareness of ischemic symptoms should be reinforced during the COVID-19 pandemic. The lack of appropriate and timely revascularization for patients with ACS might have other important clinical consequences, not yet measured, including increased risk for heart failure or sudden cardiac death.

ARTICLE INFORMATION

Data sharing: The data that support the findings of this study are available from the corresponding author on reasonable request.

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Disclosures

None.

APPENDIX

Collaborators

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