Regional differences in hospital admissions for ST-elevation and non-ST-elevation myocardial infarctions during the Coronavirus disease-19 (COVID-19) pandemic in Austria

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To the editor

The first patients with Coronavirus disease-19 (COVID-

19) were reported in Wuhan, China at the end of 2019 [1]. In February 2020, Lombardy and Veneto in northern Italy reported a dramatic increase of COVID-19 cases and became epicenters of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak in Europe [2]. On 25 February the first two cases of COVID-19 in Austria were confirmed in the neighboring region of Tyrol. In March, SARS-CoV-2 infections spread over Austria with the highest incidences in West Austria (Tyrol, Vorarlberg, Salzburg) (Fig. 1a). The Austrian government declared an emergency lockdown with a stay at home order on 16 March. The whole state of Tyrol and some regions of Salzburg were quarantined.

This survey was initiated by the Austrian Society of Cardiology to assess the incidence of acute coronary syndromes (ACS=ST-elevation and non-ST-elevation myocardial infarction, STEMI and NSTEMI) in Austria at the beginning of the COVID-19 pandemic. A total of 19 cardiac catheterization centers reported the numbers of patients with STEMI and NSTEMI admitted per week over a period of 4 weeks from 2–29 March 2020 (calendar weeks 10–13).

In these 4 weeks, 777 patients with ACS (372 with STEMI and 405 with NSTEMI) were admitted to hospital. The incidence of STEMI and NSTEMI before

the lockdown (weeks 10 and 11) compared to after the lockdown (weeks 12 and 13) decreased by 21% (STEMI: weeks 10+11: $n=208$, weeks 12+13: $n=164$, $\Delta=-44$) and by 44% (NSTEMI: weeks 10+11: $n=259$, weeks 12+13: $n=146$, $\Delta=-113$), respectively. The number of STEMI and NSTEMI hospital admissions per week showed a strong negative correlation with the total number of confirmed COVID-19 infections (Spearman $r=-1.0$, $p=0.08$). A strong decrease of ACS (STEMI and NSTEMI) was observed in all Austrian states (Fig. 1b). Remarkably, a stronger decrease was observed in West Austria with higher COVID-19 incidences (Tyrol, Vorarlberg, Salzburg) compared to East Austria with lower COVID-19 incidences (Upper Austria, Lower Austria, Styria, Vienna, Burgenland and Carinthia). The incidence of STEMI decreased by 29% in West Austria (weeks 10+11: $n=51$, weeks 12+13: $n=36$, $\Delta=-15$) and by 19% in East Austria (weeks 10+11: $n=157$, weeks 12+13: $n=128$, $\Delta=-29$), NSTEMI decreased by 65% in West Austria (weeks 10+11: $n=49$, weeks 12+13: $n=17$, $\Delta=-32$) and by 39% in East Austria (weeks 10+11: $n=210$, weeks 12+13: $n=129$, $\Delta=-81$) (Fig. 1c).

Cardiac catheterization centers around the world have reported dramatic declines in patients admitted to hospital for STEMI and NSTEMI during the COVID-19 pandemic [3, 4].

Two different reasons may have contributed to this observation. First, governmental regulations (stay at home order, social distancing, quarantine) might have led to an actual decrease of STEMI and NSTEMI by less physical activity, less emotional stress in home office, less fine dust exposure and less non-SARS-CoV-2 viral infections, all potentially triggering ACS. Second, patient and health care-related factors (e.g. fear of infections, difficult access to health care specialists) have led to an unintended underdiagnosis of ischemic events. In any case, the observed decline of STEMI

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Fig. 1 **a** COVID-19 incidence per 100,000 inhabitants in different states of Austria [6]. **b** Decrease of ACS (STEMI and NSTEMI) during COVID-19 pandemic in different states of Austria (calendar week 10 to 13). **c** Decrease of STEMI and NSTEMI in West (Tyrol, Vorarlberg, Salzburg) vs. East Austria (Upper Austria, Lower Austria, Styria, Vienna, Burgenland, Carinthia) in calendar weeks 10 and 11 before vs. weeks 12 and 13 after the lockdown. ACS acute coronary syndrome, COVID-19 Coronavirus disease-19, STEMI ST-elevation myocardial infarction, NSTEMI non-ST-elevation myocardial infarction

and NSTEMI hospital admissions is a cause for concern, as a higher than usual proportion of untreated patients with ACS may result in an increased mortality due to arrhythmias and heart failure [5].

In conclusion, our survey demonstrates that the COVID-19 pandemic in Austria led to fewer hospital admissions for STEMI and NSTEMI with an even higher decrease in West Austria with higher COVID-19 incidences.

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Conflict of interest D. Kiblboeck, J. Kellermair, P. Siostrzonek and C. Steinwender declare that they have no competing interests.

References

1. Munster VJ, Koopmans M, Doremalen N, van Riel D, de Wit E. A novel coronavirus emerging in China—key questions for impact assessment. *N Engl J Med*. 2020;382(8):692–4.
2. Rosenbaum L. Facing Covid-19 in Italy—ethics, logistics, and therapeutics on the epidemic's front line. *N Engl J Med*. 2020; <https://doi.org/10.1056/NEJMp2005492>.
3. Garcia S, Albaghadadi MS, Merai PM, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol*. 2020; <https://doi.org/10.1016/j.jacc.2020.04.011>.
4. Rodriguez-Leor O, Cid-Alvarez B, Ojeda S, et al. Impact of the COVID-19 pandemic on interventional cardiology activity in Spain. *Rec Interv Cardiol*. 2020; <https://doi.org/10.24875/RECIC.M20000120>.
5. Metzler B, Siostrzonek P, Binder RK, Bauer A, Reinstadler SJ. Decline of acute coronary syndrome admissions in Austria since the outbreak of COVID-19: the pandemic response causes cardiac collateral damage. *Eur Heart J*. 2020; <https://doi.org/10.1093/eurheartj/ehaa314>.
6. Official COVID19 dashboard public information. Federal Ministry Republic of Austria Social Affairs, Health, Care and Consumer Protection. <https://info.gesundheitsministerium.at/?l=en>

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