Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

Acute coronary syndrome-related hospital admissions during and after lockdown in Southern Germany

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The Covid-19 pandemic has affected all aspects of our daily life and challenged our health care system in an unprecedented manner [1]. The crisis even altered the health behavior resulting in additional health threats beyond Covid-19. Many countries reported a dramatic decline in cardiovascular disease-related hospital admissions. Acute coronary syndrome (ACS) admissions decreased by up to 40% in industrialized countries [2–4]. However, these findings require further examination: control periods chosen in the studies differ and may confound the results. Further, the findings may not be fully transferable to other regions. In addition, it is still unclear if the decrease of the ACS-admission rate is Covid-19 dependent or lockdown dependent.

In order to address the remaining open questions, we analyzed ACS-related hospital admissions in the strongly Covid-19 affected Greater Munich Area in 2020 before, during, and after lockdown. We compared the findings with control periods of the years 2019, 2018, and 2017. Data of ACS-related admissions were provided by the IVENA system (IVENA, Interdisziplinärer Versorgungsnachweis), an interdisciplinary online system coordinating and recording acute hospital admissions for the Greater Munich Area (Bavaria, Germany). This area covers 1000 km^2 with more than 1.8 million inhabitants. Further, we analyzed the monthly registered number of deaths in Munich, which we received from the Department of Public Order in Munich, Germany. Statistical analyses and graphs were prepared using SPSS version 25.0 (IBM Cooperation, USA). For the analyses conducted (time span during lockdown in 2020 versus 2019, 2018, and 2017; comparison of the periods before versus during versus after lockdown in 2020), non-normal distributions were detected (Shapiro Wilk: $p<0.05$). Therefore, for the comparison of independent samples Kruskal-Wallis test was calculated. Significant results ($p<0.05$) were quantified using a post-hoc testing thereafter.

The mean number of ACS admissions per day was significantly lower during lockdown compared to the period before lockdown (11.50 [9.00–14.00] versus 14.00 [12.00–17.00], $p<0.01$), and also compared to the period after lockdown (11.50 [9.00–14.00] versus 13.00 [11.00–16.00], $p = 0.03$). There was no difference comparing the period before and after lockdown in 2020 ($p = 0.32$) (Fig. 1). When comparing the lockdown period with the same time spans in previous years, we could detect a significant difference compared to the year 2019 (11.50 [9.00–14.00] versus 14.00 [10.00–17.00], $p = 0.01$), and compared to the year 2018 (11.50 [9.00–14.00] versus 13.50 [10.00–15.00], $p = 0.04$). There was no significant difference between the lockdown period and the same time span in the year 2017 (11.50 [9.00–14.00] versus 13.00 [10.00–14.00], $p = 0.42$) (Fig. 2).

The overall death rate was higher in April 2020 (during lockdown) compared to the remaining months in 2020 (relative risk 1.17, 95% confidence interval 0.98 to 1.45).

Our findings could demonstrate a decline of ACS-related hospital admissions during lockdown compared to the period before lockdown. The numbers returned to "normal" after lockdown despite ongoing Covid-19 crisis. This suggest that this observed decline is lockdown dependent. Patients avoided seeking medical care in case of ACS during this period presumably for fear of contagion. This reluctant behavior of ACS patients caused additional health care issues beside Covid-19: Haddad et al. described a delay between symptom onset and first medical contact resulting in a higher rate of major adverse cardiac events during the lockdown period [5]. After the lockdown period, the numbers of ACS-related hospital admissions returned to the level before lockdown. This suggest that easing lockdown restriction resulted in a "new normal" including people's health behavior. Worst-case scenarios, such as ongoing health care avoidance or a rebound phenomenon with increased numbers of ACS cases after lockdown fortunately did not occur.

When comparing the numbers of ACS admissions during lockdown compared to control periods in previous years, we could observe a significant reduction compared to the years 2019 and 2018, but not to the year 2017. This suggest that the reduced ACS admissions may at least in part reflect natural variations in ACS incidences.

In conclusion, we could detect a decline of ACS-related hospital

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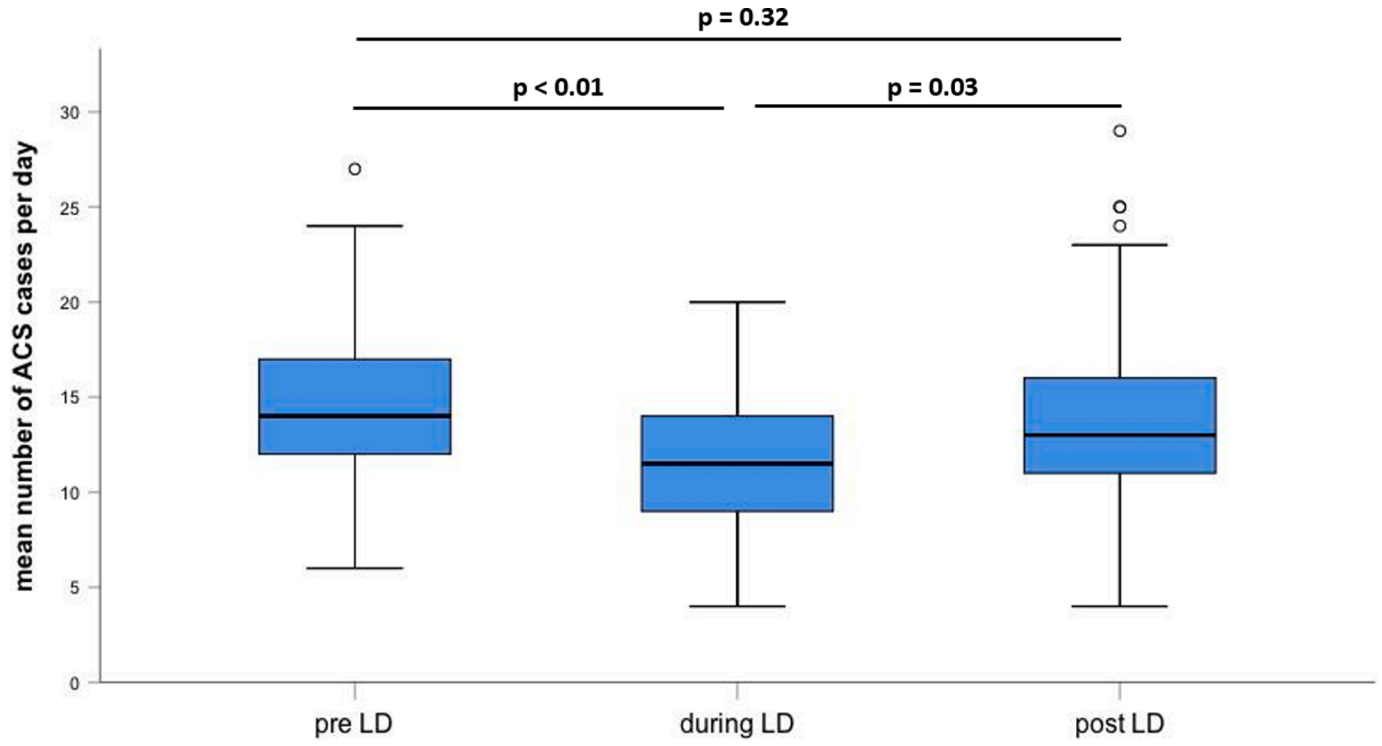

Fig. 1. Mean number of ACS admissions per day before lockdown (pre LD) versus during lockdown (during LD) versus after lockdown (post LD).

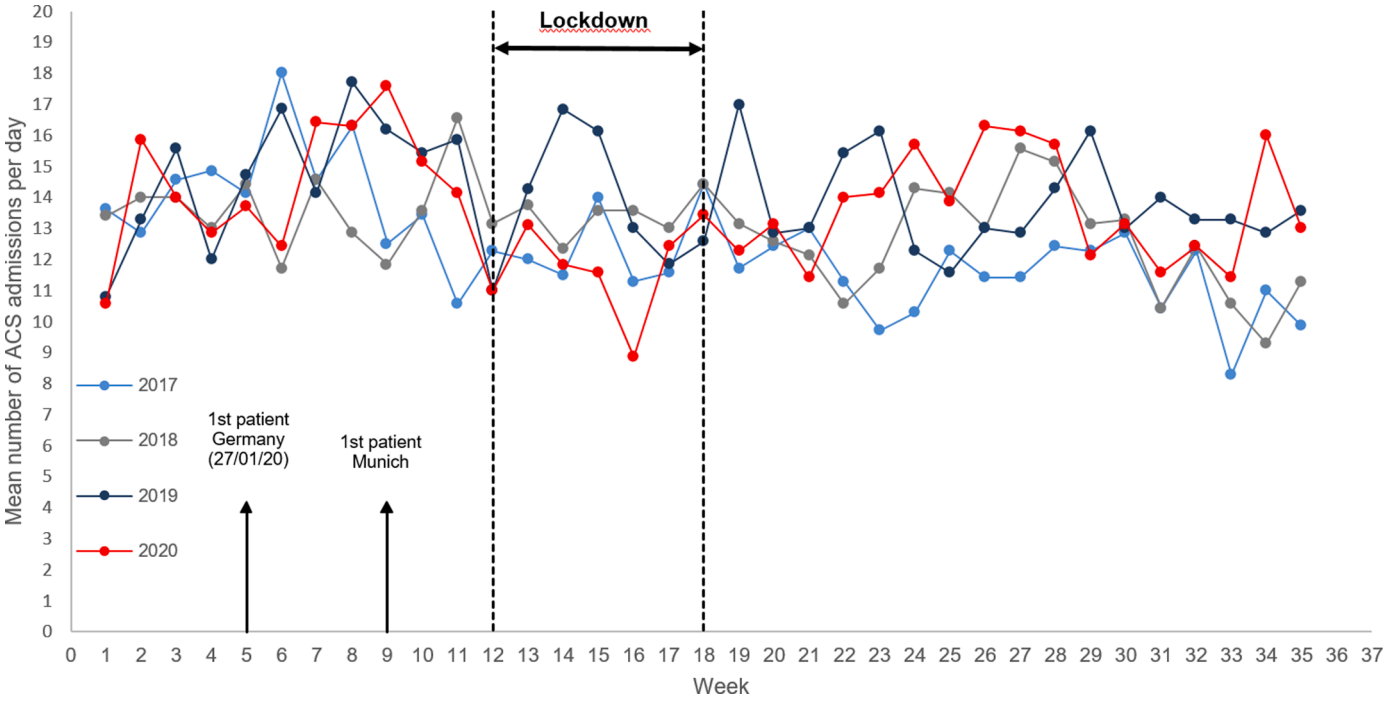

Fig. 2. Mean number of Acute Coronary Syndrome (ACS) admissions per day in the years 2017, 2018, 2019, and 2020.

admissions during lockdown, but numbers returned to the level before lockdown thereafter. Regarding ACS-related health behavior, people learnt to cope with the ongoing Covid-19 pandemic.

Declaration of Competing Interest

The authors declare they have no conflict of interest.

References

[1] Saglietto A, D'Ascenzo F, Zoccai GB, De Ferrari GM. COVID-19 in Europe: the Italian lesson. Lancet 2020;395:1110–1.

[2] Garcia S, Albaghdadi MS, Meraj PM, Schmidt C, Garberich R, Jaffer FA, et al. Reduction in ST-Segment Elevation Cardiac Catheterization Laboratory Activations in the United States During COVID-19 Pandemic. J Am Coll Cardiol 2020;75:2871–2.

[3] Mafham MM, Spata E, Goldacre R, Gair D, Curnow P, Bray M, et al. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. Lancet 2020;396:381–9.
[4] Kessler T, Graf T, Hilgendorf I, Rizas K, Martens E, von Zur Muhlen C, et al. Hospital admissions with acute coronary syndromes during the COVID-19 pandemic in German cardiac care units. Cardiovasc Res 2020;116:1800–1.
[5] Haddad K, Potter BJ, Matteau A, Gobeil F, Mansour S. Implications of COVID-19 on time-sensitive STEMI care: a report from a North American epicenter. Cardiovasc Revasc Med 2020.

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