Short Commentary

Reduction of hospitalisations and increased mortality for acute coronary syndromes during covid-19 era: Not all countries are equal

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Data by Daniel Chan and colleagues [1] from “All New Zealand Acute Coronary Syndrome Quality Improvement Registry”, a nationwide web-based electronic database, recently published in The Lancet Regional Health – Western Pacific, examined all patients admitted to an New Zealand Hospital with Acute Coronary Syndromes (ACS) who underwent coronary angiography during the lockdown (23 March –26 April 2020) respect with equivalent weeks in 2015–2019. Ambulance attendances and regional community troponin-I testing were also compared for lockdown and non-lockdown (1 July 2019 to 16 February 2020) periods.

In the study by Daniel Chan and colleagues [1], hospitalisations for ACS for 5 weeks during the lockdown were analysed; the results documented a clear reduction in hospitalisations (105 vs. 146 per-week, rate ratio 0.72 [95% CI 0.61–0.83], p = 0.003). In particular, the major component of this reduction involved myocardial infarctions without ST-segment elevation (NSTEMI-ACS; p = 0.002), while there were no significant differences in ST-segment elevation heart attacks (STEMI; p = 0.31) and door to balloon time (70 vs. 72 min, p = 0.52). In addition, the authors reported an increase in percutaneous revascularisation (59% vs. 49%, p < 0.001) compared to surgical revascularisation (9% vs. 15%, p = 0.005) in the context of NSTEMI ACS. Also, fewer ambulance attendances for cardiac arrest (98 vs. 110 per-week, p = 0.64) but no difference for suspected ACS (408 vs. 420 per-week, p = 0.44) and, above all, a marked reduction in community troponin testing were reported throughout the lockdown (182 vs. 394 per-week, p < 0.001). The main finding of the study was that, despite the low incidence of COVID-19 during the period of this survey in New Zealand, there was a nationwide decrease in ACS hospitalisations during the lockdown.

The issue of the number of hospitalisations for ACS during the pandemic has been addressed in many studies (see Table 1) [1–5]. The first study that described a reduction in the hospitalisation of patients with ACS during the pandemic was performed in Italy [2] in consecutive patients admitted in the cardiac care units (CCI) during the weekday of 12–19 March 2020, compared with the same period in 2019 [3,4]. A total of 319 AMIs were recorded during the 1 week in 2020, compared with 618 in the previous year, corresponding to a 48.4% reduction [2]. There was a 26.5% reduction in STEMI admissions and a 65.4% reduction in NSTEMI admissions [2].

Therefore, unlike Chan’s study [1], the Italian data [2] had shown, in the first European nation hit by the pandemic and with a high incidence of COVID-19, that the reduction in hospitalisations affected patients with NSTEMI as well as with STEMI. The reduction in hospitalisations for STEMI, as it was easy to predict, was associated with an increase in the mortality rate (13.7% in 2020 versus 4.1% in 2019) [2]. The delay in hospitalisation (due both to patients’ fear of going to the emergency room and the healthcare system clogged by COVID-19) has led to an increase in the rate of major complications (cardiogenic shock, life-threatening arrhythmias, heart rupture, post-infarct interventricular septal defect, and severe post-ischemic mitral regurgitation). These complications increased significantly in 2020 (from 18.8% compared to 10.4% in the previous year) [2]. The COVID-19 pandemic also caused significant

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Table 1

| Country          | Hospitalizations for myocardial infarction or SCA | STEMI | NSTEMI | Mortality | Time | Heart failure | FA, PE, DF, Stroke | Time lapse                  |
|------------------|---------------------------------------------------|-------|--------|-----------|------|---------------|--------------------|---------------------------|
| De Rosa S et al² | ITALY                                             | -48.4%| -26.5% | -65.4%    | STEMI:13.7% (versus 4.1% del 2019) | +31.5% (time from first medical contact to coronary revascularization) | AF*: -53.4% PE*: -63.2% DP*: -29.4% | 12–19 March 2020 (Lockdown) versus 12-19 March 2019 |
| Chan D ZL et al³ | New Zealand                                       | -28%  | No difference | -34%    | No difference | No difference | na                | 23 March – 26 April 2020 (Lockdown) January 1, 2019, to March 31, 2020 |
| Garcia S et al³   | USA                                               | -29%  | (number of activations for STEMI) -29% (number of activations leading to angiography) -20% (number of activations leading to PPCI*) | -34%    | No difference | D2B* times +20% | na                |                                          |
| Solomon M D et al⁴| Northern California                               | -48%  | (Decreases were similar among patients with NSTEMI and those with STEMI) | -23% (PPCI* -21%) | -42% (PCI* -37%) | (continued on next page) |
| Metzler B et al⁵  | Austria                                           | -39.4%| (Decreases were similar among patients with NSTEMI and those with STEMI) | (continued on next page) | (continued on next page) | (continued on next page) |
| Matham M M et al⁶| England                                           | -40%  | (continued on next page) | (continued on next page) | (continued on next page) | (continued on next page) | (continued on next page) |
| Rodri‡ez-Leor O et al⁷ | Spain                     | -27.6%| (continued on next page) | (continued on next page) | (continued on next page) | (continued on next page) | (continued on next page) | (continued on next page) |

(continued on next page)
| Country         | Hospitals for myocardial infarction or SCA | STEMI | NSTEMI | Mortality | Time | Heart failure FA, PE, DF, Stroke | Time lapse                                                                 |
|----------------|--------------------------------------------|-------|--------|-----------|------|----------------------------------|---------------------------------------------------------------------------|
| France         | -30%                                       | -24%  | -35%   | increased in-hospital death rate during the lockdown (5%) compared with before the lockdown (3%) |      |                                  | The 4 weeks preceding the institution of the lockdown and the 4 weeks following lockdown (Feb 17 and April 12, 2020) |
| South-West     | -24% (versus 2019)                         |       |        |           |      |                                  | January 1st and June 30th 2020 and equivalent months in the preceding 2 years, including a 5-week period corresponding to this year's COVID-19 outbreak (23rd March–26th April) |
| Germany        | -19% (versus 2018)                         |       |        |           |      |                                  |                                                                           |
|                | -25% (in April 2020 compared to January 2020) |       |        |           |      |                                  |                                                                           |
|                | -38% (versus 2019)                         |       |        |           |      |                                  |                                                                           |
|                | -30% (versus 2018)                         |       |        |           |      |                                  |                                                                           |
|                | in 5-week period of the COVID-19 outbreak in south-west Germany |       |        |           |      |                                  |                                                                           |
| Central Germany| -18.9%                                     | -3.5% | -25.3% | + 2.6% (all-cause mortality) |      | PE: +10.6%                       | March 23, 2020 and April 26, 2020 versus 2019                             |
|                |                                            |       |        | +7.6% (cardiovascular mortality) |      |                                  |                                                                           |
|                |                                            |       |        | +11.8% (cardiac mortality)§ |      |                                  |                                                                           |

* HF—heart failure; AF—atrial fibrillation; DF—device failure; PE—pulmonary embolism.
** primary percutaneous coronary intervention.
† door to balloon time.
§ percutaneous coronary intervention.
¶ cardiovascular mortality including ACS, heart failure, heart rhythm disorders (summarized as cardiac death) pulmonary embolism, and stroke.
disruption of the urgency pathways in myocardial infarction, with a 39.2% increase in the time from symptom onset to coronary angiography and a 31.5% increase of the time from first medical contact to coronary revascularisation [2]. By carrying out a more detailed analysis, in the context of STEMI, the reduction in hospitalisations was more frequent in women than in men (41.2% versus 17.8%). Other cardiac diseases, in addition to ACS, showed a decrease in hospitalisations: a net reduction in ICU admissions was recorded during the week of March 2020 compared to the equivalent week in 2019 for heart failure (-46.8 %) and atrial fibrillation (-53.4%) [2].

The reduction in the hospitalisations for ACS has been reported in many other studies. An estimated 38% reduction in STEMI activations was showed by US cardiac catheterisation laboratories [5,6] while a 40% reduction was reported in Spain [7].

The reasons for the reduced hospitalisations of ACS during the pandemic are still poorly understood and many hypotheses could explain this phenomenon. Various reasons discouraged patients to be admitted to the hospital: the lockdown, the fear of contracting the virus in the hospital setting, social isolation, and the difficulty, at least in the initial phase and the lack of separated “clean” paths. In phase I of the pandemic the clean pathways for ACS patients were not been established discouraging patients (and physicians) to require hospitalisation. The new fast-track ruling out COVID-19 protocol now allows access to the Cath lab without infection risk and should widely be applied [8]. On the other hand, it cannot be completely excluded that a potentially real reduction in acute cardiovascular events is due to low physical stress and greater rest at home during quarantine. However, this hypothesis does not explain the delay observed between symptom onset and hospital admissions for STEMI [9], as well as the increased hospital mortality and complication rates [2].

In conclusion, regulatory agencies should take into account that, even in the COVID-19 era, primary PCI is the standard of care for all STEMI patients and PCI is also the preferred strategy of therapy in all high-risk NSTEMI patients. Protected regional transports, fast-track ruling out COVID-19, safe treatment for ACS patients, and in-hospital protection all health care personnel should be organised.

These recommendations will need to be adapted to each regional system’s PCI Center and EMS system to avoid an unnecessary reduction in hospitalisations of ACS patients during the pandemic [10].

Declaration of Competing Interest

All Authors have no conflicts of interest to disclose

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