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Editorial

The non-infectious effects of COVID-19 were fierce with the weakest: What lessons did we learn?

1. COVID-19 collateral effects: beyond a viral infection

The COVID-19 outbreak declared in early 2020 obliged national authorities to implement severe structural reforms in their respective healthcare systems. Most resources were diverted to the diagnosis and management of SARS-CoV2 pneumonia. While the indisputable direct consequences of the COVID-19 have been well-established, the side effects attributable to these policies are progressively becoming evident. A recent study in Spain, a severely affected country, reported a 40% reduction on face-to-face medical visits in 2020 compared with the preceding three years, jeopardizing chronic disease management and resulting in a decreased number of cardiovascular disease diagnoses [1]. Impaired access to the health system delayed cancer diagnoses, increased time to treatment of acute cardiovascular syndromes and reduced elective cardiovascular procedures [2].

In addition to healthcare reforms, lockdowns of variable intensity, movement restriction and home isolation were warranted to slow down a pandemic that was already spreading and growing at an exponential scale. Benefits were evident in preventing SARS-CoV2 transmission, but undesired consequences were early noted, including psychological distress [3] and a change in eating and physical activity behaviours [4]. Such lifestyle changes may have a particularly detrimental effect on cardiovascular health, particularly if prolonged over time. Indeed, the positive impact of regular physical activity in the prevention of stroke, diabetes and some types of cancer is well-known. In the heart, moderate but not intense exercise reduces AF incidence [5], and prevents heart failure (HF) instauration [6]. Once established, cardiac rehabilitation may reduce HF hospitalization [7] and AF burden [8]. Thereby, reduced physical activity during lockdown may be particularly detrimental in patients with cardiovascular diseases. Detailed analyses on physical activity during lockdown in these patients are, nevertheless, scarce.

2. Physical activity during lockdown in patients with heart disease

Recently, two papers published in the International *Journal of Cardiology – Heart and Vasculature* have taken advantage of technological advances to analyze physical activity burden during COVID lockdown in patients with heart conditions. In Germany, Meretz and collaborators analyzed patients with atrial fibrillation who had recently undergone pulmonary vein isolation [9]. Patients had their physical activity monitored by means of a wristband. Data was collected for one month before and during each of the two lockdowns that were obliged in Germany. The authors observed no changes in the amount of physical activity performed during the lockdown period compared with the immediately preceding four weeks.

Results of the German study apparently contrast with Cunha et al. findings in patients with chronic HF in Portugal [10]. They evaluated the physical activity load before, during and after lockdown by means of data recorded by implantable defibrillators or resynchronization devices. A decrease in physical activity was demonstrated in the overall cohort during lockdown compared with their baseline level. Interestingly, the authors outlined that both the magnitude of the decrease and the post-lockdown recovery depended on the patient's activity level at baseline: active minutes per day decreased by a non-significant 15% and completely returned to pre-lockdown values in the most active individuals before lockdown, while those performing worse at baseline diminished their physical activity by 40%, and did not improve after finishing lockdown.

3. Please, analyze studies within its context!

Both studies yield important information on how patients with cardiovascular diseases faced lockdowns. Yet, their comparability and generalizability should be taken with caution. Governmental reactions and virus spread largely varied from country to country. Severity of movement restriction was not remarkably different in both papers, though [9,10]: outdoor physical activity was allowed, for variable periods of time, in both Germany and Portugal. However, results might have been different in countries such Spain, where the lockdown in place in March 2020 did not allow for recreational walks, or in Sweden, where hard lockdowns were avoided. A key issue is that physical activity was estimated through different manners in both manuscripts. Meretz and collaborators focused on the number of daily steps, while Cunha and collaborators collected activity data from accelerometers integrated in cardiac implantable devices as proxies for daily physical activity. They likely reflect different exercise intensities but, to the best of our knowledge, robust data correlating them are not hitherto available. Finally, sample size was low in both studies, potentially jeopardizing statistical power.

4. Is there anything to learn from all this?

Nevertheless, altogether they nicely help to depict the changes in lifestyle patterns occurring during COVID-19 lockdown in patients with heart disease, and enlighten some lessons for a (hopefully) non-pandemic future. First, post-ablation patients in the Meretz et al study, as well as the most active HF patients in Cunha et al., did not modify its physical activity or only reduced it in a very minor way; in both cases physical activity recovered to baseline values after lockdown. These

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results contrast with previous work showing that the number of steps in the general population, as recorded with an app, drastically dropped during lockdown in most countries [11]. Why "patients" did better than the general population, mostly "healthy participants"? It is possible that patients, who might have been educated on their disease, were more aware of the importance of remaining active. This may be particularly relevant for the German study, in which patients were included in a clinical trial focusing on physical activity, wore a fitness wristband, and were able to check their daily performance in an app. It seems likely that knowledge on their disease and motivation encouraged them to maintain regular physical activity even during lockdown. Indeed, current evidence supports that increased knowledge on disease and motivation improve adherence to cardiac rehabilitation [12].

Conversely, a subgroup of HF patients presented with a dramatic reduction of up to 40% in average daily physical activity [10]. These patients were older, had more comorbidities and a poorer functional class at baseline (two thirds were on NYHA III or IV), and were frailer and at a higher risk of complications and decompensation than the remaining patients. The persistently decreased physical activity load even after finishing the lockdown is particularly worrisome, as the collateral effects of lockdowns may extend well beyond its official end. In this regard, a 1-week deconditioning is enough to impair cardiovascular function [13]. It is plausible that severe reduction in physical activity in these patients may have resulted from fear and self-identification of being at high risk of severe COVID-19, prompting them for long home stays. During the pandemic, several tools have been developed and efforts have been made to cope with this issue. Scientific societies released a series of recommendations for home exercise [14]. In some centers, cardiac rehabilitation was maintained during lockdown, thereby partially blunting the deleterious consequences of home isolation [15]. Indeed, telerehabilitation had previously demonstrated to yield a similar motivation as conventional cardiac rehabilitation in randomized clinical trials [16]. Moreover, the lack of general or specialized medical attention may have increase the risk of severe decompensations, further begetting physical inactivity. Telemedicine has arisen during COVID-19 pandemics as an invaluable tool to attend patients who were unable to attend face-to-face appointments. Physical examination, a central drawback of telemedicine, has been partially, but progressively, replaced with physiological data integration with old tools such as impedance monitoring, and novel apps to register cardiac rhythm, such as the Telecheck app for AF patients [17].

5. Conclusions

Overall, both the Meretz et al. and Cunha et al. papers provide evidence that the deleterious consequences of COVID-19, particularly physical inactivity, expanded well beyond those of a viral infection, mainly affecting those at a worse condition. The need to emphasize patient education and motivation for self-care, and implementation of telemedicine and remote monitoring could have mitigated these consequences and should be regarded as important messages to retain. All these efforts should not be considered single-use-for-pandemics tools, but we may take advantage of them in the future .

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