

# Impact of the COVID-19 pandemic on blood pressure control and cardiovascular risk profile in patients with hypertension

**To the editor** The COVID-19 pandemic and consequent lockdown measures profoundly affected many aspects of daily life, including general health as well as social and economic status. This also concerns the management of cardiovascular diseases including hypertension and its self-management by affected patients.<sup>1-3</sup>

In addition to daily life and economic changes due to social distancing caused by the COVID-19 pandemic, there were also shifts in traditional risk factors for increased blood pressure (BP) and hypertension development.<sup>1</sup> For instance, lockdown measures due to the pandemic decreased physical activity which may result in an increase in the burden of cardiovascular disease worldwide. Studies evaluating physical activity during the lockdown are scant; however, those available indicate a substantial increase in physical inactivity levels during the COVID-19 pandemic with the resulting lockdown measures worldwide.<sup>1,4</sup>

One study documented a rapid decrease in the step count worldwide after the outbreak of the pandemic in more than 450 404 users of a smartphone application. An overall 27.3% reduction in mean steps within 30 days was observed.<sup>1</sup> Of note, studies performed before the pandemic indicate that similar changes in step counts led to an increase in systolic BP from 4.5 mm Hg up to 7 mm Hg in cross-sectional assessments. Keeping in mind that it is rather difficult to compare studies conducted before and during the COVID-19 pandemic, such changes in systolic BP may also provoke a rapid deterioration of cardiovascular health and an increase in premature deaths particularly among those at increased cardiovascular risk.<sup>1</sup>

The COVID-19 pandemic may also have a substantial negative effect on other cardiovascular risk factors such as dietary patterns or alcohol consumption that may promote increases in body weight.<sup>1,5</sup> In addition, other traditional risk factors such as smoking, emotional/psychologic stress, and changes in sleep patterns and diurnal rhythms may also be seriously affected by the lockdown measures and social isolation.<sup>1</sup>

In summary, the impact of COVID-19 on BP control and cardiovascular risk profile deserves careful clinical evaluation since the consequences of a potential impact on many aspects of daily life as well as environmental changes may be observed in the long-term follow-up. The beneficial and adverse effects of lockdown and self-isolation on BP during the COVID-19 pandemic are summarized in [TABLE 1](#).

## **Impact of delayed care on blood pressure control**

During the COVID-19 pandemic and lockdown restrictions, regular care for patients with hypertension was not available or was delayed in many regions of the world. Recent data from the survey of the 52 excellence centers (ECs) of the European Society of Hypertension (ESH) including 20 European and 3 non-European countries showed that the number of patients treated per week decreased by 90% from a median of 50 before the pandemic to a median of 5 during the pandemic. Of note, 60% of patients declared limited access to medical consultations and 85% of the ECs reported a shutdown lasting 9 weeks.<sup>6,7</sup> In the long term, such limited access to emergency room visits, hospital admissions, medical consultations, and pharmacies may result in delayed diagnosis and management of hypertension in primary care settings. This, in turn, may have deleterious consequences in hypertensive patients and may partially contribute to poorer control of BP beyond the COVID-19 pandemic.<sup>1,6</sup> The limited access to general practitioners highlighted the need to develop new strategies, including implementation of home BP measurements and introduction of telemedical consultations in outpatient clinics in many countries across the world.<sup>8,9</sup>

**Adherence to antihypertensive therapy** Currently, there are no data available as to how and to what extent the COVID-19 pandemic might have affected adherence to antihypertensive (BP-lowering) medications. Taking into consideration economic consequences of the COVID-19

**TABLE 1** Beneficial and adverse effects of lockdown and self-isolation on blood pressure during the COVID-19 pandemic (modified from Kreutz et al<sup>1</sup>)

Factors influencing blood pressure levels related to the lockdown and/or self-isolation
Potential effect on blood pressure increase
<ul style="list-style-type: none"><li>• Alcohol consumption ↑</li><li>• Amount of food consumed ↑</li><li>• Snacking ↑</li><li>• Intake of processed “comfort foods” rich in carbohydrates and salt ↑</li><li>• Intake of foods rich in potassium ↓</li><li>• Psychical activity ↓</li><li>• Sitting time ↑</li><li>• Sleep quality ↓</li><li>• Anxiety ↑</li><li>• Depression ↑</li><li>• Psychological distress ↑</li><li>• Adherence to therapy ↓</li><li>• Therapeutic inertia ↑</li><li>• Time to diagnosis of hypertension ↑</li><li>• Time to achieving blood pressure goals ↑</li></ul>
Potential effect on blood pressure decrease
<ul style="list-style-type: none"><li>• CO<sub>2</sub> emissions and air pollution ↓</li><li>• Duration of sleep ↑</li><li>• Environmental noise ↓</li><li>• Work-related stress ↓</li></ul>

Abbreviations: ↑, increase; ↓, decrease; CO<sub>2</sub>, carbon dioxide

pandemic directly related to economic aspects of daily life, the cost of antihypertensive drugs may become more relevant, particularly in healthcare systems with substantial copayments to medication.<sup>1,6</sup> Of note, a recent study from the United States clearly documented the relationship between cost-related medication nonadherence and hypertension control.<sup>6</sup>

In summary, in hypertensive patients, BP control and also adherence to antihypertensive treatment should be evaluated strictly not only during the COVID-19 pandemic, but also when restrictions are eased.

**Influence of mass media on blood pressure control during the COVID-19 pandemic** Treatment with the renin–angiotensin system (RAS) blockers has been suggested to upregulate the cell-entry receptor of the SARS-CoV-2 virus, that is, angiotensin-converting enzyme 2 (ACE2), on cell surface. Shortly after the outbreak of COVID-19, there were concerns that the use of ACE inhibitors or angiotensin receptor blockers (ARBs) might favor the risk of COVID-19 or the severity of the disease. This had major potential clinical implications since ACE inhibitors and ARBs are the backbone of therapy for hypertension and other cardiorenal diseases.<sup>7,10</sup> In this context, switching to another antihypertensive agent was suggested and these considerations, initially confined to medical journals, were widely broadcasted in the mass media.<sup>10,11</sup>

Although the ESH (as early as in March 2020) and other medical societies (including national

hypertension societies) strongly recommended not to discontinue RAS inhibitors, uncertainty remained among patients and physicians.<sup>1,10,11</sup> Recent data have showed that specialists working in ECs of the ESH received a significant number of enquiries regarding this issue in early months of the COVID-19 pandemic.

Of note, one-quarter of ECs reported that some hypertensive patients discontinued RAS blockers on their own and one-third reported that some physicians discontinued RAS blockers in selected patients.<sup>10–12</sup> Of note, a recent meta-analysis of a large number of studies have shown that chronic treatment with either ACE inhibitors or ARBs does not significantly affect the risk or severity of COVID-19.<sup>11,12</sup>

**Blood pressure and cardiovascular consequences of SARS-CoV-2 infection** The clinical spectrum of SARS-CoV-2 infection may range from asymptomatic to life-threatening, fatal disease with persistent severe symptoms and end-organ dysfunction when affecting the lungs, cardiovascular system, and kidneys.

The cardiac involvement of COVID-19 ranges from mildly elevated cardiac biomarkers to clinical course accompanied by acute cardiogenic shock and sudden cardiac death.<sup>11,13</sup>

Based on the COVID Symptom Study, post-acute COVID-19 appears to be a multisystem disease with long-term sequelae of cardiovascular complications and is defined as the presence of symptoms beyond 3 weeks from the initial onset.<sup>13,14</sup>

A postacute syndrome is particularly well recognized in patients who are recovering from a serious illness, in particular requiring hospitalization and admission to the intensive care unit.

It has been reported that patients who are recovering from SARS-CoV-2 infection may manifest persistently elevated BP. It has been suggested that prolonged periods of mechanical ventilation and associated sedation, repeated administration of inotropic agents, fever, hypoxia, inflammation, and ischemia may all result in activation of the RAS and / or the sympathetic nervous system.<sup>13,14</sup> After recovery from COVID-19, these changes may lead to persistently elevated BP in previously normotensive individuals or favor poor BP control in patients with a pre-existing controlled hypertension.<sup>13–16</sup> Since the data on the impact of COVID-19 on BP control in patients recovering from COVID-19 are scant, longitudinal observational studies will be needed to elucidate long-term consequences of SARS-CoV-2 infection on BP control.<sup>13–16</sup>

**Blood pressure variability in patients with COVID-19** A recent study showed that in patients with COVID-19 and hypertension, high BP fluctuations were associated with worse clinical outcomes as compared with normotensive patients. It has also been shown that observed increased BP variability was associated not only with advanced

age, heart and renal injury, and augmented activity of inflammatory markers, but also with worse clinical outcomes.<sup>17</sup>

### Impact of COVID-19 pandemic–related lockdown on blood pressure control in patients with hypertension: current evidence

Until now, only a single small study evaluated the impact of the COVID-19 pandemic–related lockdown on BP control in patients with hypertension.<sup>18</sup> A total of 126 patients were recruited and followed by phone in a single-center study done in a hypertension unit in Milan, Italy. All participants were routinely instructed to follow the standard rules for home BP monitoring (HBPM) and to fill a home BP logbook. Each patient was asked to report at least 3 morning HBPM measurements over the period of 2 weeks before and after March 22, 2020, the day when the Italian government implemented national COVID-19 restrictions in Italy.<sup>18</sup>

The main finding of the study was that during the COVID-19 pandemic, despite limited access to healthcare services, HBPM values were either similar or even lower compared with those taken before lockdown and those from a corresponding reference time the year before. During lockdown, patients exhibited lower systolic and diastolic HBPM values compared with the prelockdown period.<sup>18</sup>

The results of the study are difficult to explain and may suggest that several factors, including staying and working from home, limiting trips and social distancing, led to physical and psychological relaxation associated with lockdown and might have prevailed over the COVID-19 stressors in the group of hypertensive patients.<sup>18</sup>

More studies on this topic are needed to better characterize the impact of COVID-19–related lockdown restrictions on BP control and factors predicting BP changes in large cohorts of patients with the use of 24-hour ambulatory BP monitoring (ABPM). Therefore, in February 2021, the ESH COVID-19 Task Force initiated the ESH ABPM COVID-19 study. The main goal of this study is to determine the impact of the COVID-19 lockdown on 24-hour BP profiles and BP variability. This will be done by comparing individual ABPM results obtained before and during the COVID-19 lockdown in hypertensive patients receiving treatment.

### ARTICLE INFORMATION

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