

# Climate changes and arterial hypertension – global risk. Environmental hypertensiology

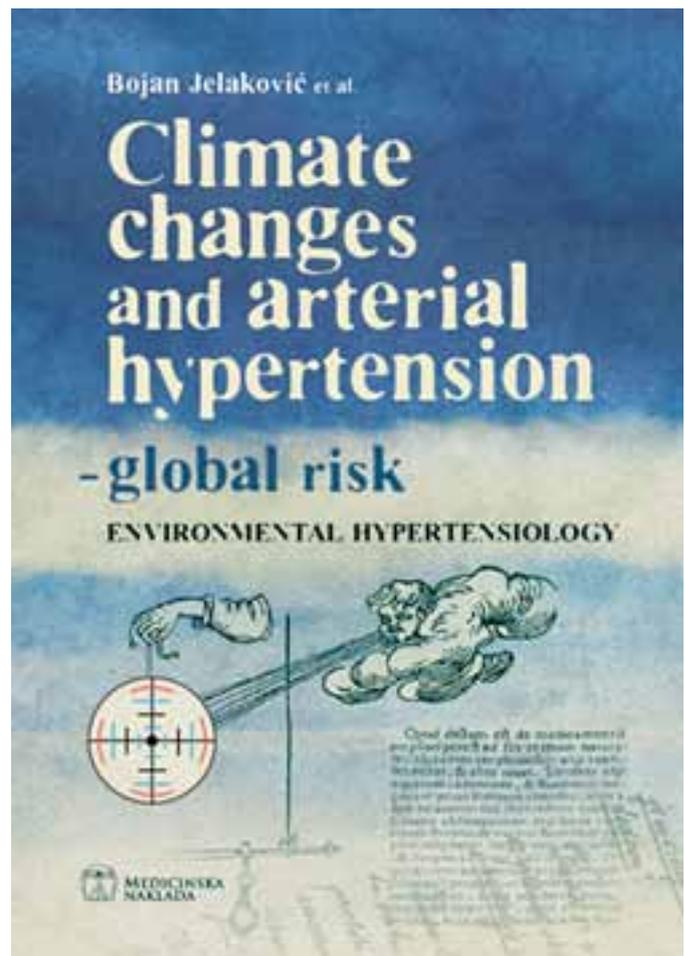
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Seasonal changes in climate have long been recognized in the expert and scientific community as one of the important factors that influence the variability of blood pressure, which is associated with damage to target organs, increased incidence of cardiovascular events, total mortality, and damaged renal function. Even the general population and patients with arterial hypertension feel this influence, and especially common question is whether to take antihypertensive medication during the summer months. There is growing and justified fear that this issue will become even more pronounced given that we know that the irrational actions of a greedy civilization are bringing about a period of global climate change, the effects of which we can unfortunately already feel.

When discussing cardiovascular diseases, the deadly quartets, quintets, and sextets of conditions that exacerbate them have been feared for decades. Today, in the 21st century, we are faced with a new deadly quintet comprising arterial hypertension, obesity, diabetes, air pollution, and climate change. However, the influence of climate change on health is not such a new thing, as scientists and physicians had noticed the association of variable blood pressure and ambient temperature almost a century ago. Over the last fifteen years, numerous studies with large numbers of participants have confirmed the association between seasonal temperature variations as well as various metrological parameters, primarily ambient temperature, and arterial pressure, changes in hemodynamics and hormone concentrations crucial for blood circulation homeostasis, as well as increased cardiovascular morbidity and mortality. Due to the above, and the fact that there is insufficient awareness of this complex phenomenon despite its importance both for everyday clinical practice and in research, the European Society of Hypertension published a consensus document in 2020 with key facts and recommendations for clinical practice with regard to seasonal arterial pressure variation.

Meteorological measurements started in Croatia approximately 170 years ago. However, the first written record on the influence of climate changes on health dates from the 16th century, from when the physician Santorio Santorio lived in the Kvarner Gulf at the invitation of the Frankopan nobles from the island of Krk, researching the influence of the *bora* (a strong and cold northerly wind) on human health. He constructed several instruments during this time (the anemometer, thermoscope, and hygroscope), which he described in a report published in 1625, shortly after Galileo Galilei constructed his liquid-based thermometer. The first official meteorological station in Croatia was founded in 1851 by Professor Ivan deBortili in the city of Dubrovnik, and the Royal Observatory at the Geophysical Institute in Zagreb was founded in 1861, primarily due to the efforts of Josip Torbar, the



rector of the Royal Gymnasium at the time, who conducted the first measurements together with Ivan Stožir and Spas Vatsov. They also worked with one of the greatest scientists in the history of mankind, Andrija Mohorovičić, who, coincidentally or not, hailed from the Kvarner Gulf (the town of Volosko), and who uttered an important statement during that collaboration, which should hold for all scientific research, not just that in meteorology and medicine: “He who has a moral obligation to conduct certain measurements must do so accurately or not at all. Better not to measure at all than to measure poorly.” The Meteorological Institute of the Republic of Croatia was founded in August 1947 in Zagreb and was renamed to the Croatian Meteorological and Hydrological Service in 1991. The fact that precise measurements

have been conducted in Croatia for over a century was honored with an award from the World Meteorological Organization in 2019, when the meteorological institute in Zagreb was added to the list of deserving and accredited institutes and meteorological measurement stations (the Centennial Observation Station by World Meteorological Organization). The systemic nature of the century-long high-quality measurements conducted in Croatia is further demonstrated by that fact that this list also includes the meteorological stations in Gospić and Hvar. Sadly, our meteorological measurements are in agreement with those from across the world, confirming that we live in a dangerous period of global warming and all the climate changes that come with it.

The negative trend of changes in climate and their influence on health has also inspired us to conduct several studies on the influence of meteorological parameters and seasonal changes on arterial pressure and arterial hypertension in Croatia. As part of a project by the Croatian Science Foundation called “Epidemiology of arterial hypertension and salt intake in Croatia (EH-UH 2)” that was concluded this year, we analyzed the association between arterial pressure and a number of meteorological variables as well as air pollution data. According to the preliminary results, there was a significant association between blood pressure values and ambient temperature, but no association with barometric pressure and air humidity. We observed clear seasonal variations in arterial pressure. Detailed analyses are forthcoming, which will among other things examine the influence of climate change on the prevalence of arterial hypertension and blood pressure control achieved in patients treated for arterial hypertension. Fifteen years ago, we analyzed the incidence of hypertensive crises and found that they are most common during the colder months, which is in agreement with findings by other authors.

Inspired by all of the above, and with the goal of discussing the dangers of climate change to human health and contributing to raising awareness on the importance of combatting irrational policies regarding climate change, the Croatian League for Hypertension has organized an international conference under the sponsor-

ship of the Croatian Academy of Sciences and Arts in April of 2022 titled “Climate Change, Arterial Pressure, and Total Risk – Environmental Hypertensiology”, which has resulted in this book. “Medicinska naklada” is publisher and book has 253 pages and 9 chapters. Fifty four eminent experts and physicians are authors of this prestigious publication which is endorsed by the Croatian Academy for Science and Arts.

Similar publications have already been published internationally, but based on the information we have this book appears to be the most comprehensive on this aspect of health, which is what makes it special. It encompasses not only blood pressure as a crucial variable for arterial hypertension, but also metabolic disorders as well as changes in hemodynamics and hormones, all of which make arterial hypertension a very complex syndrome. The reader will find chapters on target organ damage, on climate change and children, on the influence on diet plans, and finally on the relationship with hypertensive medication. Two years ago, the Croatian Society of Hypertension and the Croatian League for Hypertension, in cooperation with the Servier company, organized education programs for physicians specializing in cardiology, nephrology, and family medicine on the association between climate change and arterial hypertension, focusing on the crucial role of continuous arterial pressure measurement. Our education programs have currently been completed by about 1500 physicians, and further education programs are planned.

All our efforts, and now also this book, are aimed at showing the irrationality and irresponsibility that exist at the global level with regard to climate change. We want to prepare our physicians for these new challenges and traps which could easily fortify the position of arterial hypertension as the main factor for morbidity and mortality in the world. In our hunt for the Silent Killer, namely arterial hypertension, the Croatian League for Hypertension has added this dangerous new helper to the well-known list of the “demons” of arterial hypertension, i.e. modifiable risks factors. We realize this is but a small drop in the global efforts on this topic, but we trust it will join them in weaving the waterfall of rationality.