



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Letter to the Editor



## COVID-19 vaccines effect on blood pressure

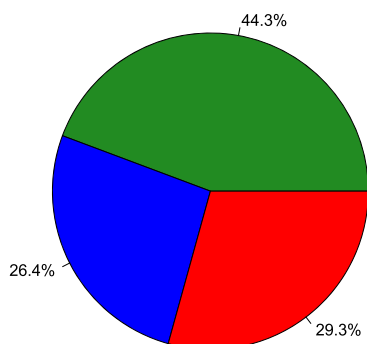
Recently, with the SARS-CoV-2 vaccination campaign progress, evidence of possible alteration of blood pressure (BP) associated with vaccination has increased [1]. BP changes occurred in two directions, as shown by evidence of hyper- and hypotensive episodes, which lead many authors to monitor and report the most striking cases they have treated [2–5].

Since during the vaccination period we revealed a general increase of requests for a BP control and consequent changes in therapy following vaccine administration, we designed a dedicated survey to monitor this

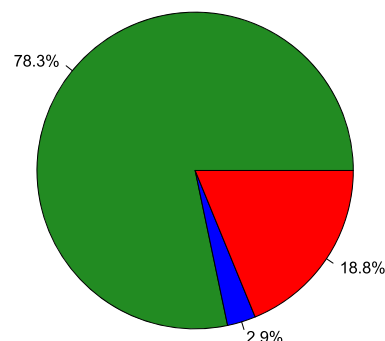
phenomenon and address it to internal healthcare workers only. This choice was considered the most appropriate due to two reasons: from one side the level of health literacy was more homogeneous among healthcare workers, which is fundamental in controlling individual heterogeneity in answers provided by self-administrated questionnaires. Second, we could have rapid access to a population with very homogeneous vaccination periods, independently by age, gender, and other factors that in the general population are used to stratify different vaccination administration time. Moreover, this enhances the usefulness

## BLOOD PRESSURE CHANGES AFTER SARS-CoV-2 VACCINATION

## Subjects with BP increase (n=140\*)



## Subjects with BP decrease (n=69\*)



## Subjects with no change (n=1593\*)

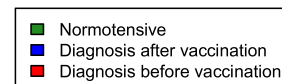
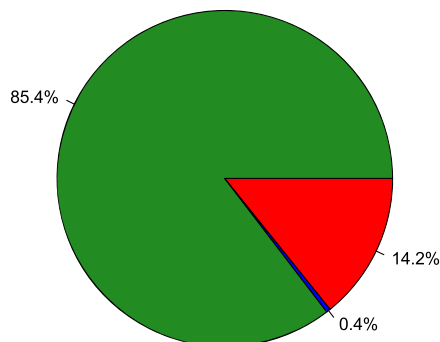


Fig. 1. Reported BP changes after mRNA SARS-CoV-2 vaccination according to known history of hypertension. \* = 64 patients omitted hypertension history. GREEN: No history of hypertension; RED: history of hypertension already known before vaccination; BLUE: new diagnosis of hypertension done after vaccination. BP= blood pressure.

<https://doi.org/10.1016/j.ejim.2022.08.027>

Received 10 August 2022; Accepted 22 August 2022

Available online 23 August 2022

0953-6205/© 2022 European Federation of Internal Medicine. Published by Elsevier B.V. All rights reserved.

of these results for future studies, where crossing survey results with more clinical individual information may be possible due to the existence of internal biobank, that include clinical data on institutional workers.

**RESULTS:** A total of 1870 subjects (69% female, 31% male) answered the questionnaire. 1866 subjects underwent the anti-SARS-CoV-2 vaccination course (mostly with Comirnaty® Pfizer (93% 1st dose, 94% 2nd dose, and 75% for the booster dose; Spikevax® Moderna was only significantly used for 23% of booster doses)

Only 16% of the subjects declared a previous diagnosis of hypertension and 32% of respondents reported a regular BB control (mostly 1/month).

153 subjects (8%) reported an increase in BP values after vaccination and 70 subjects (4%) observed a decrease in blood pressure. BP alterations presented with greater frequency at the 2nd or booster dose. Associated symptoms were headache (39%), general malaise (34%), and dizziness (18%). Only in 39 subjects (2%), a concomitant diagnosis of hypertension was done after this discovery of BP alteration (Fig. 1). Among the 281 subjects already on antihypertensive therapy, 13% declared a change in antihypertensive therapy (11% had to increase therapy, 2% reduced it).

From an epidemiological point of view, 36% had COVID-19 disease (50% before vaccination, 39% after the booster dose).

Although the theory of pandemic evolution is still under an ongoing debate, this data supports the recommendation of a high level of active surveillance on BP measurements after vaccination, especially if a further dose should be required in fragile patients.

These results show how up to 10% of the general population may have an alteration in blood pressure values after the completion of a vaccination course. So, our aim is to focus the attention of the operators, who are dealing with the daily treatment of BP disorders, on short-medium term the consequences that a new vaccination campaign could expose.

How mRNA vaccines could affect blood pressure is not known and there are many hypothesized mechanisms. The identification and discussion of such routes are beyond the aim of this letter; however, it would be very helpful in understanding the underlying pathways of the disease to monitor these BP changes over a longer period.

## Declaration of Competing Interest

The authors declare they have no conflict of interest.

## Acknowledgments

Hayden Carl Nortje (RSA) for English supervision. **Members of the Multidisciplinary Epidemiological Research Team Study Group:** Prof. Clelia Di Serio<sup>1</sup>, Dr. Matteo Moro<sup>2</sup>

<sup>1</sup>Vita-Salute San Raffaele University, Milan, Italy.

<sup>2</sup>Infection Control, Chief Medical Office, IRCCS San Raffaele Scientific Institute, Milan, Italy.

## References

- [1] Angeli F, Reboldi G, Trapasso M, Santilli G, Zappa M, Verdecchia P. Blood pressure increase following COVID-19 vaccination: a systematic overview and meta-analysis. *J Cardiovasc Dev Dis* 2022;9:150.
- [2] Zappa M, Verdecchia P, Spanevello A, Visca D, Angeli F. Blood pressure increase after Pfizer/BioNTech SARS-CoV-2 vaccine. *Eur J Intern Med* 2021;90:111–3.
- [3] Bouhanick B, Montastruc F, Tessier S, Brusq C, Bongard V, Senard JM, Montastruc JL, Herin F. Hypertension and Covid-19 vaccines: are there any differences between the different vaccines? A safety signal. *Eur J Clin Pharmacol* 2021;77:1937–8.
- [4] Sanidas E, Anastasiou T, Papadopoulos D, Velliou M, Mantzourani M. Short term blood pressure alterations in recently COVID-19 vaccinated patients. *Eur J Intern Med* 2022;96:115–6.
- [5] Meylan S, Livio F, Foerster M, Genoud PJ, Marguet F, Wuerzner G, Center CCV. Stage III hypertension in patients after mRNA-based SARS-CoV-2 vaccination. *Hypertension* 2021;77:e56–7.

Marco Simonini<sup>a</sup>, Maria Giovanna Scarale<sup>b,\*</sup>, Francesca Tunesi<sup>a,b</sup>, Paolo Manunta<sup>a,b</sup>, Chiara Lanzani<sup>a</sup>, on behalf of the Multidisciplinary Epidemiological Research Team Study Group

<sup>a</sup> Nephrology and Dialysis Unit, IRCCS San Raffaele Scientific Institute, Milan, Italy

<sup>b</sup> Vita-Salute San Raffaele University, Milan, Italy

\* Corresponding author.

E-mail address: [scarale.maria@univr.it](mailto:scarale.maria@univr.it) (M.G. Scarale).