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REVIEW ARTICLE

The impact of COVID-19 pandemic on obstetrics and gynecology hospitalization rate and on reasons for seeking emergency care: a systematic review and meta-analysis

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ABSTRACT

Background: During the lockdown due to COVID-19 pandemic, utilization of emergency care units has been reported to be reduced for obstetrical and gynaecological reasons. The aim of this systematic review is to assess if this phenomenon reduced the rate of hospitalizations for any reason and to evaluate the main reasons for seeking care in this subset of the population.

Methods: The search was conducted using the main electronic databases from January 2020 to May 2021. The studies were identified with the use of a combination of: "emergency department" OR "A&E" OR "emergency service" OR "emergency unit" OR "maternity service" AND "COVID-19" OR "COVID-19 pandemic" OR "SARS-COV-2" and "admission" OR "hospitalization". All the studies that evaluated women going to obstetrics & gynecology emergency department (ED) during the COVID-19 pandemic for any reason were included.

Results: The pooled proportion (PP) of hospitalizations increased from 22.7 to 30.6% during the lockdown periods, in particular from 48.0 to 53.9% for delivery. The PP of pregnant women suffering from hypertensive disorders increased (2.6 vs 1.2%), as well as women having contractions (52 vs 43%) and rupture of membranes (12.0 vs 9.1%). Oppositely, the PP of women having pelvic pain (12.4 vs 14.4%), suspected ectopic pregnancy (1.8 vs 2.0), reduced fetal movements (3.0 vs 3.3%), vaginal bleeding both for obstetrical (11.7 vs 12.8%) and gynecological issues (7.4 vs 9.2%) slightly reduced.

Conclusion: During the lockdown, an increase in the proportion of hospitalizations for obstetrical and gynecological reasons has been registered, especially for labor symptoms and hypertensive disorders.

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Emergency unit; obstetric emergency; hospitalization; systematic review; COVID-19; SARS-CoV-2; pregnancy

Introduction

In 2020, SARS-COV-2 infection spread from China to all over the world, causing a pandemic. The first and most important consequence had been that countries started to reorganize their health resources in order to face the increased request for care and management of COVID-19 ill people [1]. In this regard, many subspecialty societies and expert consensus released guidelines and position papers with the aim both of evaluating the direct impact of the infection on specific diseases and of stating to stop all non-urgent medical and surgical treatments [2–6]. The latter advice served to reduce the usual crowding of hospitals and healthcare settings, which were deemed as a potential route of contagion. Accordingly, governments decided on a strict lockdown, lasting differently among nations based on the local spread of SARS-COV-2 pandemic. As forecasted [7], the impact on

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maternal-fetal wellness and obstetric care has been very tough, and pregnancy is considered a risk factor for a severe course of COVID-19 [8,9]. Moreover, SARS-COV-2 infection during pregnancy is associated with modifications in pregnancy management [10,11], an increase in adverse pregnancy outcomes [12–14], the need for hospitalization [15] and delivery in more than 50% of affected cases [16]. In this scenario, we observed an important decrease in the number of Emergency Unit accesses for obstetric care in our university hospital of Naples during the first lockdown, as proof of previously excessive use of such healthcare resource settings by pregnant women [17]. Thus, the pandemic raises the question of the importance of counseling in maternal-fetal medicine to allow pregnant women to learn when emergency care is needed [18,19]. The aim of this systematic review was to evaluate whether the hospitalization rate for obstetrics and gynecology conditions was changed during the pandemic and to assess the spectrum of conditions for which care was required.

Materials and methods

Study protocol

The review was performed according to a protocol recommended for systematic review. The study was reported according to the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA) statement [20]. The review protocol was designed *a priori*, defining methods for collecting, extracting and analyzing data. All review stages were conducted independently by three authors. In particular, three authors independently assessed electronic search, eligibility of the studies, inclusion criteria, risk of bias, data extraction and data analysis. Disagreements were resolved by discussion with senior authors.

Literature search and study selection

The literature search was conducted using MEDLINE, Embase, Web of Sciences, Scopus, ClinicalTrial.gov, OVID and Cochrane Library as electronic databases. The studies were identified with the use of a combination of the following text words from January 2020 to May 2021: “emergency department”; “A&E” OR “emergency service”; “emergency unit”; “maternity service”; “COVID-19”; “COVID-19 pandemic”; “SARS-COV-2”; “admission”; “hospitalization”. A review of articles also included the abstracts of all references retrieved from the search. Duplications were removed using Endnote online software and also manually.

We included in our systematic review all randomized and non-randomized studies that evaluated the population of women going to Obstetrics & Gynecology Emergency Department during the period of COVID-19 pandemic for any reasons; studies considering specifically obstetrical and delivery outcomes without mentioning the rate of admissions/hospitalization were excluded.

Risk of bias assessment

The risk of bias and quality assessment of the included studies were performed using the Newcastle-Ottawa Scale (NOS) [21]. The NOS score was used to evaluate the included studies, and judgment on each one was passed according to three issues: selection of the study group, comparability between groups, and ascertainment of exposed/not exposed cohorts.

Data extraction and analysis

Data were extracted from the included studies without modifications. The main data extracted for our systematic review were: obstetrical and or gynecological emergency department access rate; hospitalization rate; any reasons (indications) for seeking emergency obstetrical or gynecological consultation.

The proportion of hospitalizations and any reasons for seeking emergency obstetrical or gynecological consultation was calculated for both lockdown and control periods. In particular, each proportion was calculated as the number of events by the total access to the obstetrical and or gynecological emergency department. Proportions were calculated for each included study as a pooled estimate and graphically reported on forest plots with 95% confidence interval (CI). All analyses were performed by adopting the random effect model of DerSimonian and Laird. Quantitative analysis was carried out only when at least three studies considered one of the variables of interest.

Statistical heterogeneity among included studies was evaluated by the inconsistency index I^2, as previously described [22–24]. In detail, heterogeneity was classified as: null for $I^2 = 0\%$, minimal for I^2 b 25%, low for I^2 b 50%, moderate for I^2 b 75% and high for $I^2 \geq 75\%$. Comprehensive Meta-Analysis (Biostat,14 North Dean Street, Englewood, NJ 07631, USA) and Review Manager 5.3 (Copenhagen: The Nordic Cochrane Center, Cochrane Collaboration, 2014) were used as data analysis software.

Results

Study selection and study characteristics

A total of 350 articles were initially identified by the search; of these, 58 articles were duplications and thus removed. The titles and abstracts of 292 articles were scrutinized and ultimately 21 were selected for full-text retrieval and eligibility assessment. After the exclusion of studies not meeting the selection criteria, 10 studies [17,25–33] were included in the systematic review and meta-analysis analyses (Figure 1).

The general features of the studies and the risk of bias are illustrated in Table 1. Two studies were performed in the USA [25,33], one in France [26], one in India [30], two in Israel [31,32] and four in Italy [17,27–29]. Apart from the study by Goyal et al. [30], which was prospective, the others were retrospective case-control analyses. Athiel et al. [26] performed a multicenter study considering almost 40 thousand women. The time periods considered varied across countries, according to local pandemic waves, and the observations were of around one month for 4 studies [27,28,32,33], around two months for 2 studies [25,31], three months for 2 studies [17,26], and five months for other 2 studies [29,30].

Synthesis of the results

Evaluable outcomes from included studies are reported in Table 2, while pooled proportions are detailed in Table 3. The pooled proportion of hospitalizations for any obstetrical or gynecological issue increased from 22.7% to 30.6% during the lockdown periods and in particular from 48.0% to 53.9% for delivery. In detail, looking at the main indications for seeking emergency care, we observed that the pooled proportion of pregnant women suffering from hypertensive disorders increased (2.6% vs 1.2%), as well as women having impending labor (52% vs 43%) and premature rupture of membranes (12.0% vs 9.1%). Oppositely, we found that the proportion of women having pelvic pain (12.4% vs 14.4%), suspected ectopic pregnancy (1.8% vs 2.0%), reduced fetal movements (3.0 vs 3.3%) slightly reduced, as well as vaginal bleeding both for obstetrical (11.7%vs 12.8%) and gynecological issues (7.4% vs 9.2%).

Discussion

Main findings

During the lockdown periods, despite a reduction was noticed in the overall number of people seeking care for obstetrical and/or gynecological reasons, access to the obstetrical and gynecological emergency unit led to more frequent hospitalizations, especially for delivery, with either uterine contractions or rupture of membranes, and especially for hypertensive disorders which were found increased in comparison to the previous year or control periods.

Strength and limitations

As far as we know, this represents the first pooled analysis for the evaluation of hospitalizations for obstetrical and/or gynaecological reasons during the lockdown for COVID-19. The main strengths of our analysis are the adherence to PRISMA guidelines and the large number of outcomes considered. Limitations of our study may be the retrospective designs and wide heterogeneity among studies, both in the outcomes evaluated and in the definitions for different outcomes, because of which sometimes it was not possible to cumulate the data. In fact, populations from different countries in the included studies might have different variances; this might underlie the wide heterogeneity among the studies which we found.

Interpretation of the study findings, clinical and research implications

In a previous study, we observed an overall reduction in the number of obstetrics and gynecology emergency visits during the lockdown period [17]. Moreover, we demonstrated that pregnant women refused to perform prenatal invasive diagnosis procedures, despite the number of deliveries remaining constant and even increasing during the lockdown, as proof that women were coming to the hospital when there were no other options [10]. In line with the latter observation, we found the same phenomenon in this pooled analysis, with an increase in the number of hospitalizations, especially for labour symptoms and hypertensive disorders during pregnancy. Considering that contractions and vaginal discharge are among the most common reasons for seeking emergency visits, the finding of increased hospitalizations for these conditions during the lockdown might be explained as proof of an overall reduction in the number of unnecessary visits for unclear conditions, which were the cause of overwhelming of emergency units. Therefore, patients requested medical attention only when labor symptoms were truly specific and the need was real. Hypertensive disorders were found to increase by the studies which analyzed this item, and

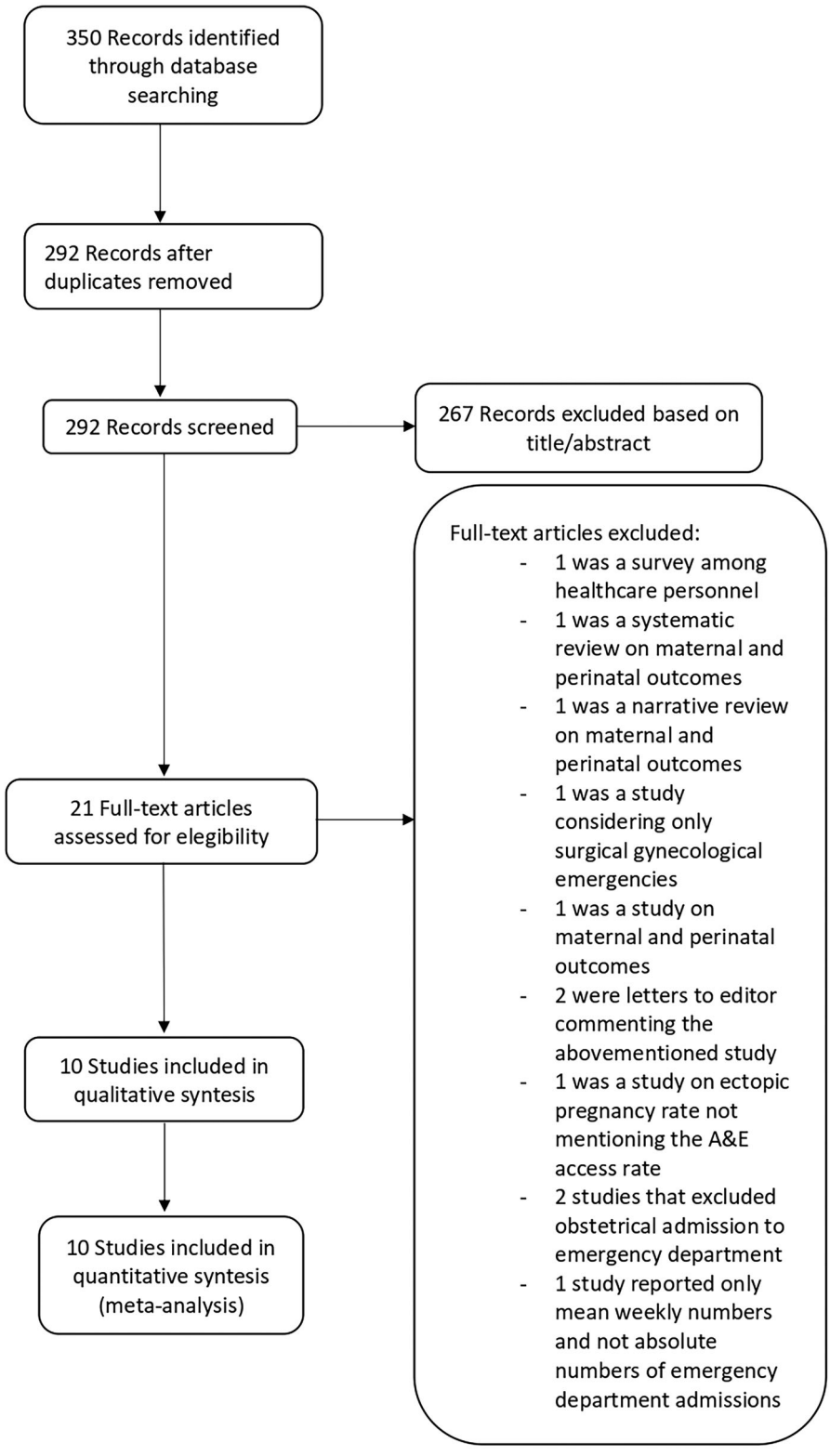

Figure 1. Flow-diagram of studies identified in the systematic review.

an explanation could be found in the more sedentary lifestyle imposed during the lockdown, as well as in the eventual reduction in the antenatal care appointments, with the consequence of missed antenatal screenings, although this has not been directly demonstrated. Vaccinal programs are now in place to reduce the burden of SARS-CoV-2 infection, although the propensity seems not very high, especially among obstetrical populations [34–37]. Blakeway et al. [38] observed that less than one-third accepted COVID-19

Table 1. Features of the included studies.

Authors, year	Study location	Study design	Sample size	Period considered	Ienclusion criteria	Exclusion criteria	NOS scale
Abel et al. 2021 [25]	San Francisco, USA	Retrospective case-control	11,788 (4903 vs. 6885)	March 4 – May 19, 2020 vs January 1 – March 3, 2020	Females aged 18 or older presenting at ED for obstetrical or gynaecological conditions	None	8
Athiel et al. 2020 [26]	France	Retrospective case-control	39,690 (14,708 vs. 24,982)	March–May 2020 vs 2019	All patients admitted to gynaecological ED and the proportion of later hospitalized	None	6
Carbone et al. 2020 [3]	Naples, Italy	Retrospective case-control	3269 (1483 vs. 1786)	March–May 2020 vs 2019	All patients admitted to the obstetric A&E unit	None	7
Dell'Utri et al. 2020 [29]	Milan, Italy	Retrospective case-control	9291 (3647 vs. 5644)	February–June 2020 vs 2019	All consecutive women admitted to the ES during the considered periods were included, independently of their age or reason for admission.	None	7
Goyal et al. 2020 [30]	Jodhpur, India	Prospective, case-control	1749 (633 vs 1116)	1 April , 2020 – 31 August 2020 vs. 1 October , 2019 – 29 February 2020	all pregnant women hospitalized during the study period	Outpatient visits	8
Grandi et al. 2020 [28]	Modena-Sassari-Cagliari, Italy	Retrospective case-control	691 (209 vs. 482)	March 11 – 9 April , 2020 vs. 1 November– 30 November 2019	Only women who presented to the ED for gynecological reasons (not pregnancy) or for problems related to the first trimester of pregnancy (threatened miscarriage, EP, and PUL), were considered as a non-deferrable activity.	Admissions during the 2nd and 3rd trimesters of pregnancy and the puerperium.	6
Kugelman et al. 2020 [32]	Haifa, Israel	Retrospective case-control	942 (398 vs. 544)	15 March 2020 –12 April 2020 vs 15 March 2019 –12 April 2019.	All the women above 20 weeks of pregnancy who presented to the obstetrical ED during the study period due to an obstetrical or non-obstetrical self-complaint. Women who were referred by their physicians after presenting with acute complaints such as contractions, vaginal bleeding, and RFM.	All the women with missing data and those referred by their physicians after incidental findings at regular surveillance or who were invited for a follow-up visit.	7
Meyer et al. 2020 [31]	Israel	Retrospective case-control	7964 (3897 vs 4067)	February –March 2020 vs 2019	All women referred to the ED during the study period	None	7
Salsi et al. 2020 [27]	Bologna, Italy	Retrospective case-control	1456 (484 vs. 972)	March 2020 vs 2019	Patients were divided into three groups: gynecological patients, pregnant women up to 16 weeks, and pregnant women > 16 weeks.	None	6
Spurlin et al. 2020 [33]	New York City, USA	Retrospective case-control	354 (79 vs 275)	February 1 to March 15 vs. March 16 to April 15	All consult requests from the ED to the GYN, GYN oncology, or OB services were included.	Inpatient OB-GYN consults for patients who were hospitalized and patients who were seen in labor and delivery triage.	5

ECS: elective cesarean section; ED: emergency department; EP: ectopic pregnancy; HBP: high blood pressure; ICU: intensive care unit; IOL: induction of labor; IUD: intra-uterine death; GDM: gestational diabetes mellitus; GYN: gynecology unit; NICU: neonatal intensive care unit; OB: obstetric unit; PE: Preeclampsia; PID: pelvic inflammatory disease; PIH: pregnancy-induced hypertension; pPROM: preterm premature rupture of membranes; PROM: premature rupture of membranes; PTB: preterm birth; PUL: pregnancy of unknown location; RFM: reduced fetal movements; TOP: termination of pregnancy.

Table 2. Outcomes of the included studies.

Variables	Abel et al. 2021 [25]	Athiel et al. 2020 [26]	Carbone et al. 2020 [3]	Dell'Utri et al. 2020 [29]	Goyal et al. 2020 [30]	Grandi et al. 2020 [28]	Kugelman et al. 2020 [32]	Meyer et al. 2020 [31]	Salsi et al. 2020 [27]	Spurlin et al. 2020 [33]	Total
Ob/Gyn ED admissions	4903 vs 6885	14708 vs 24982	1483 vs. 1786	3647 vs 5644	633 vs. 1116	209 vs. 482	398 vs. 544	3897 vs. 4067	484 vs. 972	79 vs. 275	30,441 vs. 46,753
Mean maternal age	NR	NR	NR	NR	NR	38.6 ± 12.9 vs. 38.2 ± 14.8	31.4 ± 4.3 vs. 31.3 ± 4.7	32 ± 5.2 vs. 32 ± 5.5	NR	NR	–
Ectopic pregnancy	NR	NR	15/1483 vs. 17/1786	16/3647 vs. 20/5644	NR	NR	NR	NR	NR	10/79 vs. 55/275	41/5209 vs. 92/7705
PROM	NR	NR	110/1483 vs. 158/1786	NR	NR	NR	82/398 vs. 60/544	NR	53/484 vs. 77/972	NR	245/2365 vs. 295/3302
Reduced fetal movements	NR	NR	28/1483 vs. 41/1786	NR	NR	NR	26/398 vs. 45/544	NR	10/484 vs. 18/972	NR	64/2365 vs. 104/3302
HDP	NR	NR	45/1483 vs. 27/1786	49/3647 vs. 48/5644	NR	NR	NR	NR	22/484 vs. 15/972	NR	116/5614 vs. 90/8402
Uterine contractions*	NR	NR	821/1483 vs. 807/1786	NR	NR	NR	309/398 vs. 389/544	NR	110/484 vs. 168/972	NR	1240/2365 vs. 1364/3302
Vaginal bleeding (ob)	1148/4903 vs. 1802/6885	NR	282/1483 vs. 394/1786	181/3647 vs 339/5644	NR	NR	22/398 vs. 33/544	NR	74/484 vs. 132/972	NR	1707/10915 vs. 2700/15,831
Vaginal bleeding (gyn)	739/4903 vs. 1128/6885	NR	NR	58/3647 vs. 99/5644	NR	42/209 vs 115/482	NR	NR	26/484 vs 85/972	NR	865/9243 vs. 1427/13,983
Pelvic pain (gyn)	1082/4903 vs. 1494/6885	NR	NR	114/3647 vs. 291/5644	NR	41/209 vs. 132/482	NR	NR	26/484 vs. 70/972	25/79 vs. 65/275	1288/9322 vs. 2052/14,258
Hospitalizations	NR	785/14, 708 vs 976/24,982	583/1483 vs. 642/1786	NR	NR	41/209 vs. 50/482	257/398 vs. 279/544	NR	226/484 vs 367/972	27/79 vs 75/275	1919/17361 vs. 2389/29,041
Hospitalization for delivery	NR	NR	579/1483 vs. 520/1786	1126/3647 vs. 1103/5644	583/633 vs. 1062/1116	NR	198/398 vs. 189/544	1666/3897 vs. 1654/4067	NR	NR	4152/10,058 vs. 4528/13,157

*This outcome is a fusion of pelvic pain (obstetrical), meaning non-labor contractions, and proper labor contractions. ED: emergency department; Gyn: gynecological; HDP: hypertensive disorders of pregnancy; NR: not reported; Ob: obstetrical; PROM: premature rupture of membranes.

Table 3. Pooled proportions for the outcomes of interest.

Outcome	Studies included in the analysis	Lockdown period		Control period	
		Observations	Pooled proportions (95% CI)	Observations	Pooled proportions (95% CI)
Hospitalizations	6	1919/17,361	30.6 (10.2−63.0)	2389/29,041	22.7 (7.1−52.7)
Hospitalizations for delivery	5	4152/10,058	53.9 (40.9−66.4)	4528/13,157	48.0 (29.9−66.6)
Hypertensive disorders	3	116/5614	2.6 (1.3−5.2)	90/8402	1.2 (0.8−1.9)
Uterine contractions	3	1240/2365	52.0 (25.6−77.2)	1364/3302	43.0 (18.9−71.0)
PROM	3	245/2365	12.0 (6.2−21.9)	295/3302	9.1 (7.7−10.7)
Pelvic pain	5	1288/9322	12.4 (4.5−30.1)	2052/14,258	14.4 (6.8−28.0)
Ectopic pregnancy	3	41/5209	1.8 (0.3−10.8)	92/7705	2.0 (0.1−25.4)
Reduced fetal movements	3	64/2365	3.0 (1.2−7.0)	104/3302	3.3 (1.3−8.6)
Vaginal bleeding (ob)	5	1707/10915	11.7 (6.1−21.5)	2700/15,831	12.8 (6.5−23.7)
Vaginal bleeding (gyn)	4	865/9243	7.4 (2.2−21.8)	1427/13,983	9.2 (3.3−23.4)

vaccination during pregnancy, with similar pregnancy outcomes compared with unvaccinated pregnant women, and a recent meta-analysis confirmed these results [39]. Given that time is still needed to reduce the spread of the SARS-CoV-2 infection and the achievement of herd immunity, it is very important to control people's anxiety [40,41] with continuous information regarding the safety of vaccines against SARS-CoV-2 and proper utilization of healthcare resources, starting from seeking care when truly needed, both avoiding to go to the hospital for non-urgent conditions and not underestimating symptoms of illness due to fear of contagion, therefore risking a worsening of the disease. In this regard, more data are awaited on the safety of vaccines in pregnant women to help the decision-making process. In the meanwhile, many guidelines have been released on the management of COVID-19-affected pregnant women [42]. Also, the role of general practitioners appears of utmost importance, being the first medical resource to which usually people refer before going to hospitals.

Conclusion

During the lockdown, an increase in the proportion of hospitalizations for obstetrical and gynecological reasons has been registered, especially for labour symptoms and hypertensive disorders. Further studies on the safety of vaccines against SARS-CoV-2 would probably help to normalize the unnecessary request for medical care and access to emergency units.

Disclosure statement

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