Impact of the SARS-COV-2 Outbreak on Epidemiology and Management of Major Trauma in France: Registry-Based Study. The COVITRAUMA Study

Jean-Denis Moyer (jean-denis.moyer@aphp.fr)
Assistance Publique - Hôpitaux de Paris https://orcid.org/0000-0002-4244-7340

Arthur James
APHP: Assistance Publique - Hopitaux de Paris

Clément Gakuba
CHU Caen: Centre Hospitalier Universitaire de Caen

Mathieu Boutonnet
Percy military hospital

Emeline Angles
CHU Bordeaux GH Pellegrin: Centre Hospitalier Universitaire de Bordeaux Groupe hospitalier Pellegrin

Emmanuel Rozenberg
APHP: Assistance Publique - Hopitaux de Paris

Jean Bardon
APHP: Assistance Publique - Hopitaux de Paris

Thomas Clavier
CHU Rouen: Centre Hospitalier Universitaire de Rouen

Vincent Legros
CHU Reims: Centre Hospitalier Universitaire de Reims

Marie Werner
AP-HP

Quentin Mathais
Military Teaching Hospital Sainte Anne: HIA Sainte Anne

Veronique Ramonda
CHU Toulouse: Centre Hospitalier Universitaire de Toulouse

Yann Berthelot
Capgemini institution

Clelia Colas
capgemini invent fance

Pierre Le Minh
APHP: Assistance Publique - Hopitaux de Paris

Julien Pottecher
CHU Strasbourg: Hopitaux universitaires de Strasbourg
Tobias Gauss
APHP: Assistance Publique - Hopitaux de Paris

Original research

Keywords: COVID-19, trauma, France, Traumacenter

Posted Date: January 13th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-139432/v1

Version of Record: A version of this preprint was published on March 22nd, 2021. See the published version at https://doi.org/10.1186/s13049-021-00864-8.

Abstract

Background

Evidence increases to suggest that the reallocation of health care resources during considerable the COVID-19 pandemic impacts considerably any health system. This study describes the epidemiology and the outcome of major trauma patients admitted to centers in France during the first wave of the COVID-19 outbreak.

Methods

This retrospective observational study included all consecutive trauma patients aged 15 years and older admitted into 15 centers participating to the TraumaBase® registry in France during the first wave of the SARS-CoV-2 pandemic in France.

Results

Over a 4 years-study period, 5762 patients were admitted between the first week of February and mid-June. This cohort was split between patients admitted during the first 2020 pandemic wave in France (pandemic period, 1314 patients) and those admitted during the corresponding period in the three previous years (2017-2019, 4448 patients). Patient demographics changed substantially during the pandemic and more specifically during the lockdown period specially with a reduction in both absolute numbers admitted and the proportion of road traffic accidents (348 annually 2017-2019 [55.4 % of trauma admissions] vs 143 [36.8 %] in 2020 $p<0.005$). Mortality during the pandemic period and the difference between predicted and observed mortality was not different compared to the non-pandemic years.

Conclusions

During this first wave of COVID-19 in France, management of trauma patients admitted to regional Traumacenters was not significantly altered, despite medical resources being reallocated and reorganized. Mortality as well as prehospital and in hospital care remained stable throughout the period of the first pandemic wave despite a massive increase in demand for acute care beds.

Background

In December 2019 Wuhan, China, experienced an outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1][2]. This outbreak was declared a pandemic by World Health Organization, and has spread to the entire World. France was not spared and the number of COVID-19 cases has grown since the end of January 2020 and recently reached his climax in April 2020. In order to stem the spread of SARS CoV-2, the French government imposed a first national lockdown in France from March 13, 2020 for a duration of 55 days.

Despite extensive public health interventions, a large number of patients were admitted to French intensive care units, mainly with acute respiratory distress syndrome (ARDS). As a consequence of the massive and constant influx of patients SARS-CoV-2 pandemic had a major impact on health care system. The COVID-19 led to a massive increase in the demand for acute care beds and challenged existing surge capacity. This required a fast and thorough restructure of the health care system [3]. Cornerstones were postponement of non-urgent medical consultations and interventions with reallocation of manpower and resources for COVID-19 patients, so limiting resources for needs other than COVID-19 [4].

More specifically, the impact on the French trauma system, was expected to be important, considering that all three key actors namely prehospital emergency services, intensive care units and anesthesiology services, were highly involved in the management of COVID-19 patients. All three components were adjusting their usual structure and working methods to face this pandemic. This reorganization exposed to the lack of essential resources, destabilization of the trauma system and inappropriate or even deleterious delays in definitive care. Potential mitigation was offered as a consequence of the national lockdown reducing movement and road traffic accident but in turn potentially offset by increasing numbers of assaults or fall from height secondary to suicide attempts [5][6].

Altogether, these indirect effects of the COVID-19 pandemic may generate detrimental effects on trauma networks and could increase trauma associated mortality. Evidence is growing to suggest that the effect of the SARV-CoV-2 pandemic on overall mortality will be complex and beyond the direct consequences of the disease overcome a single organ affection [7–9].

For these reasons, this study set out to explore the impact of the COVID-19 pandemic and the subsequent reorganization of the national health care system on the epidemiology, management and mortality of trauma patient admitted to trauma centers across France in the first wave of 2020. The results may identify areas of improvement for future pandemics waves and inform future public health policy decisions.

Methods

Study design

We conducted a multicentric cohort-based observational study from 2017 to 2020. During each of these 4 years, all consecutive trauma admitted into 15 regional trauma centers participating in the Traumabase registry (Additional file 1) from the first week of February to the end of the second week of June were included. This study is reported according to the STROBE guidelines for observational studies [10] (Additional file 2).

Data source

The Traumabase registry prospectively collects socio-demographic, clinical, biological, therapeutic, and in-hospital evolution data for all severely injured patients admitted to a participating center and suspected of severe trauma. For each patient, data collection ranges from the prehospital scene to hospital discharge. Every participating center admits all consecutive severe trauma occurring in their respective geographical area allowing for a cohort-based overview of severe trauma care in each given area. Severe trauma is defined as a situation suggesting life threatening or changing injuries (Additional file 3)[11].

Data analysis

Patients were stratified according to their year of admission, allocating those admitted the years 2017, 2018 and 2019 in one group (non-pandemic period) and those admitted in 2020 into another group (pandemic period).

To explore the effect of the lockdown, 3 periods were defined for each of these years:

- the *pre-lockdown*: week 6 to week 12 (respectively lasting from the beginning of the first week of February to the end of the second week of March (2017–2019) and from the February 3rd to March 16th for 2020,
- the *lockdown*: week 12 to week 20 (respectively lasting from the beginning of the third week of March to the end of the end of the second week of May (2017–2019) and from March 17th to May 10th for 2020),
- and the *post-lockdown*: week 20 to week 24 (respectively lasting from the beginning of the third week of May to the end of the second week of June (2017–2019) and from the May 11th to June 15th for 2020).

For each year, these 3 periods were divided in 18 consecutive weeks. These consecutive weeks were matched by calendar weeks allowing for comparisons across similar segments of time across the year 2020 and previous years [eg: Weeks 16 of the previous years can be compared to Week 16 of the year 2020].

Outcomes

For each of the 3 periods, the number of patients admitted in the participating centers is reported. For each patient, age, gender, injury mechanism, injury severity (Injury Severity Score (ISS)) [12], new Simplified Acute Physiology Score (SAPS2) [13], haemorrhagic shock (transfusion of more than four blood products within six hours) [14] and traumatic brain injury (TBI) (intracranial bleeding on CT scan), trauma management (pre-hospital and intra-hospital time, surgery during the first 24 h, duration of mechanical ventilation length, length of stay and decision of withdrawal of care decisions) and mortality are reported. The Trauma ISS (TRISS) is used to compare the observed mortality to the expected mortality [15].

Statistical analysis

Variables with an overall proportion of missing data > 10% between 2020 and previous years were not included. Missing data were not imputed and are reported for each variable in Additional file 4. All statistics were computed using Python and the Traumabase®registry; no patients were excluded. Continuous variables are described by mean and standard deviation, whereas categorical variables are described in number (percentage). Each variable result over the previous years (2017, 2018 and 2019) were summarized using its mean. Significance tests were computed at a level of confidence of 95% using: a non-parametric test of Mann-Whitney for continuous variables, and a Chi-2 test for discrete and categorical ones. The comparisons were made between 2020 and the previous years (2017–2019) on each period (pre-lockdown, lockdown and post lockdown).

Results

Over the integral 4 year-period, 5762 patients were admitted between the first week of February and the end of the second week of June. This cohort was split between patients admitted during this time frame in 2020 (1314 patients) and those admitted during the same time frame the 3 previous years (2017–2019, 4448 patients).

Tables.1 illustrates the baseline characteristics of both cohorts.

Pre-Lockdown period

- Patients characteristics

Admissions remained stable during *pre-lockdown* (404 admissions during the previous years vs 501 in 2020) (Fig. 1). There was no difference in patients ‘characteristics and severity (Table 1).

Table 1
Epidemiology of patients admitted at Traumacenter in 2020 and compared to previous years

		Period					
		Pre-lockdown (February 3rd – March 16th)		Lockdown (March 16th – May 10th)		Post-lockdown (May 11th – June 15th)	
Variable		Previous years	2020	Previous years	2020	Previous years	2020
Number of admitted patients		404	501	628	361	434	436
Age (Years)		41.5 (19.1)	42.7 (20.1)	41.5 (19.0)	43.2 (19.9)	39.6 (18.7)	39.6 (18.9)
Gender Female)		92 (22.8)	101 (20.2)	136 (21.7)	65 (18)	92 (21.2)*	65 (14.9)*
Penetrating trauma		58 (14.4)	63 (12.6)	68 (10.8)	53 (14.7)	50 (11.5)	52 (11.9)
Mechanism of injury distribution	Road traffic accident	202 (50)	237 (47.3)	348 (55.4)*	133 (36.8)*	245 (56.5)	231 (53)
	Fall from height	92 (22.7)	108 (21.5)	126 (20.1)*	128 (35.5)*	84 (19.4)	97 (22.2)
	Aggression	74 (18.3)	84 (16.8)	90 (14.3)*	63 (17.4)*	65 (15)	69 (15.8)
	Fall from standing	19 (4.7)	23 (4.6)	30 (4.8)*	23 (6.4)*	14 (3.2)	16 (3.7)
	Other	15 (3.7)	16 (3.2)	25 (4)*	11 (3)*	18 (4.1)	19 (4.4)
ISS		15.6 (12.6)	15.0 (12.5)	15.8 (13.4)	16.4 (12.6)	15.0 (11.9)	16.2 (12.3)*
TRISS		0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)
SAPS 2		27.1 (19.4)	26.6 (19.3)	27.8 (20.0)	27.9 (19.1)	26.3 (19.2)	27.1 (18.8)
Hemorrhagic shock		24 (5.9)	25 (5)	46 (7.3)	20 (5.5)	27 (6.2)	22 (5)
Traumatic brain injury		109 (27)	107 (21.4)	152 (24.2)	87 (24.1)	105 (24.2)	108 (24.8)

* Difference between 2020 and Previous years significant with p value a ≤ 0.05

Data are N (%), mean (Standard Deviation);

Period
ISS: Injury Severity Score, TRISS: Trauma Related Injury Severity Score, SAPS 2: Simplified Acute Physiology Score

- Trauma management

Helicopter transportation (49 [12.1%]vs 39 [7.8%] p = 0.0007) and the rate of pre-hospital orotracheal intubation (85 [21%]vs 82 [16.4%] p = 0.002) decreased without any change in total pre-hospital time (81.9 min [71.4] vs 79.6 min [48.2] p = 0.866). Secondary admissions were more frequent in 2020 (72 [17.8%] vs 106 [21.2%] p = 0.035). A slight reduction of the frequency of surgery or interventional radiology to control haemorrhage was noted in 2020 (14 [3.5%] vs 6 [1.2%] p = 0.029).

Lockdown period

- Patients characteristics

The comparison highlights a significant reduction of overall admissions during the 2020 period (628 admissions during the previous years vs 361 in 2020) (Fig. 1) (Table.1). The absolute number and proportion of road traffic accidents decreased during the *lockdown* (348 [55.4%] vs 143 [36.8%] in 2020 p < 0.005) while other mechanisms remained stable in proportion (fall from height, assault, fall from standing) (Figs. 2 and 3) (Table.1). Injury severity evaluated by ISS (15.8 [13.4] vs 16.4 [12.6] p = 0.126), SAPS 2 (27.9 [19.1] vs 27.8 [20.0], p = 0. 415) and incidence of traumatic brain injury (152 [24.2%] vs 87 [24.1%] p = 0.704) and hemorrhagic shock (46 [7.3%]vs 20 [5.5%] p = 0.350) were not different from previous years.

- Trauma management

Prehospital care and hospital care were similar between 2020 and previous years (Table 2). The only difference was an increase in the time in the trauma bay in 2020 (29 min [28.7] vs 33.5 min [46] p = 0.006). The proportion of patients requiring surgical intervention in the first 24 hours was identical (311 [49.5] vs 181 [50.1%] p = 0.418). Length of stay in the intensive care unit (ICU) (5.8 days [14.8] vs 6.8 days [13.8] p = 0.155) and duration of mechanical ventilation (7.5 [11.7] days vs 9.6 [15.9] days p = 0.154), were comparable to the previous years.

Table 2
Prehospital and hospital management patients admitted at Traumacenter in 2020 and compared to the previous years

	Period					
	Pre-Lockdown (February 3rd – March 16th)		Lockdown (March 16th – May 10th)		Post-Lockdown (May 11th – June 15th)	
Variable	Previous years	2020	Previous years	2020	Previous years	2020
In hospital Mortality	35 (8.6)	33(6.6)	62 (9.9)	21 (5.8)	34 (7.8)	38 (8.7)
Variations of the difference between the predicted mortality (TRISS) and observed mortality	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)
Transportation to hospital (helicopter)	49 (12.1)*	39 (7.8)*	84 (13.4)	38 (10.5)	67 (15.4)	67 (15.4)
Pre-hospital orotracheal intubation	85 (21)*	82 (16.4)*	131 (20.9)	70 (19.4)	98 (22.6)	87 (20)
Pre-hospital time (min)	81.9 (71.4)	79.6 (48.2)	80.4 (82.4)	80.0 (45.9)	76.6 (50.4)	81.2 (47.8)
Intra-hospital time (min)	28.4 (26.5)	31.31 (37.0)	29.0 (28.7)*	33.5 (46.0)	27.2 (26.3)	27.0 (18.0)
Surgery in the first 24 hours (%)	193 (47.8)	224 (44.7)	311 (49.5)	181 (50.1)	212 (48.8)	217 (49.8)
Immediate surgical or arteriography intervention	14 (3.5)*	6 (1.2)*	21 (3.3)	8 (2.2)	15 (3.5)	13 (3)
Length of mechanical ventilation (days)	8.8 (14.3)	7.5(11.2)	7.5 (11.7)	9.6 (15.9)	8.2 (16.3)	6.5 (9.1)
Length of stay (days)	6.4 (13.5)	5.1 (8.8)	5.8 (14.8)	6.8 (13.8)	6.6 (20.3)	5.2 (8.7)
Admission from non traumacenter hospital	72 (17.8)*	106 (21.2)*	94 (15)	55 (15.2)	65 (15)	76 (17.4)
Patient with decisions of withdrawal of care	23 (5.7)*	14 (2.8)*	34 (5.4)	18 (5)	19 (4.4)	25 (5.7)
* Difference between 2020 and Previous years significant with p value ≤ 0.05						
Data are N (%), mean (SD)						

Post lockdown period

- Patients characteristics

In *post-lockdown*, more women were affected by major trauma in 2020 (92 [21.2%] vs 65 [14.9%] p = 0.004) while the number of road traffic accidents (245 [56.5%] vs 231 [53%] p = 0.202) was equivalent. ISS was significantly higher than in previous years (15 [11.9] vs 16.2 [12.3] p = 0.04) whereas SAPS 2 scores (27.1 [18.8] vs 26.3 [19.2] p = 0.146) were equivalent to the previous years.

- Trauma management

Prehospital care and hospital care did not differ between pandemic and non-pandemic periods (Table 2)

Mortality

Mortality between previous years and 2020 remained stable throughout all three phases (Fig. 4) (Table 2). No significant difference was noted between observed and predicted mortality rates among any of the study periods (Fig. 5) (Table 2).

Discussion

Overview

To our knowledge this is the largest study on a national scale to explore the impact of the COVID-19 pandemic and the associated reallocation of health care resources on the care of major trauma patients. The results demonstrate a significant impact on the epidemiology of trauma in France during lockdown but not pandemics period. The national lockdown imposed by authorities to control the pandemic reduced the overall trauma incidence in particular the frequency of road traffic accidents. The reallocation of critical care resources did not substantially alter the capacity of the health care system to provide high standards of care for the severely injured.

Several factors may explain this observation. During this COVID-19 2020 spring wave, a substantial volume of critical care capacity was reallocated to absorb COVID-19 patients with the risk to reduce capacity available for major trauma [4]. In France, the vast majority of designated trauma centers are also the regional referral or tertiary care centers, suggesting a potential competition between patient cohorts for critical care resources. However as demonstrated by Lefrant et al. this potential effect was partially compensated by the surge in intensive care beds [16]. Furthermore, the present results document the national lockdown generated a sufficient reduction in overall trauma incidence of 43% compared to previous years. This decrease obviously prevented the overflow of trauma centers.

The injury patterns and patient characteristics in the period immediately before, during and after lockdown are very similar to the corresponding period in the previous years. The reduction in road traffic accidents was not accompanied by a surge in assault or suicide; except for road traffic accidents, all trauma mechanisms conveyed a similar number of injured victims. Trauma centers did not restrict their

admission policy, as indicated by the similar median ISS across the study period, injury patterns were identical.

In terms of the quality of care, prehospital transport did not seem different from the previous years [17]. The rate of secondary admissions from a non-traumacenter hospital increased whereas prehospital intubations decreased slightly during the pre-lockdown period. It could whether reflect an adaptation transition during the pre-lockdown period (representing the impact of SARS-CoV-2) or just a natural variation.

Time in the trauma bay increased slightly during lockdown, but the effect was probably minimal on patient outcome. The proportion of patients operated within the first 24 hours remained identical suggesting timely access to complex trauma surgery was not impeded. The observed and predicted mortality remained stable and comparable to previous years during this spring surge suggesting that the prehospital to intrahospital 24-hour rescue chain and subsequent critical care capacity remained intact for major trauma. The trauma systems in the areas assessed in this study appeared resilient enough to absorb the shock of the 2020 COVID-19 spring surge and provide adequate and appropriate care equivalent to previous years.

These reassuring results will nevertheless require re-evaluation, for any second wave of the pandemic. In fact, this first wave was characterized by a complete and imposed stop of all elective surgical and medical procedures to free up crucial resources. This may not be the case in a second wave that may require to continue to provide a large spectrum of medical and surgical procedures to maintain the best possible chances for patients not affected by COVID-19 in particular those affected by oncological disease. As stated above, the study by Lefrant *et al*. reports 4,806 newly created ICU beds (+ 95% increase) in France [16]. Without these adjustments, the strain on the trauma care networks could have been far higher and could have altered the level of care provided.

Limitations

The authors acknowledge some limitations inherent to the exceptional context and observational retrospective nature of the study based on a trauma registry. The results are based on data collected in fifteen trauma centers, with six centers contributing from the Paris region alone. This selection of a mix from urban and rural areas may not be representative of the entire French territory. However, the centers included are the level-1 referral centers in two of the most highly affected pandemic areas during the 2020 spring wave in France (Ile de France, Grand Est). The increase and intense clinical workload during the study period may have affected the capacity of clinicians and research assistants to collect data. Third, the database does not provide any data on the long-term and functional outcome of patients after TBI (such as the Glasgow Outcome Scale Extended (GOS-E) for TBI or quality of life). Consequently, we were unable to evaluate any significant outcomes other than in-hospital mortality. Moreover, data on proportion of trauma patients who were also COVID-19 positive and how it alters the mortality is not available. In addition, this study only considers patients who were admitted alive at the hospital, so it is

impossible to confirm that the number of severely traumatized patients who died in the pre-hospital setting has not increased [18].

Conclusions

Our study provides an insight of epidemiology and management of trauma patients during the 2020 COVID-19 pandemic in France for the most affected areas. During this period and more specifically during lockdown, the study demonstrated a 50% reduction in road traffic accidents with no increase in alternative injury mechanisms, such as assault or suicide. Observed and predicted mortality and a number of crucial process indicators remained stable compared to previous years suggesting a sufficient resilience of the trauma networks assessed to absorb the spring 2020 pandemic hit. This study suggests that the care for major trauma patients was not substantially impacted by the SARS-CoV-2 2020 first phase in France.

Abbreviations

COVID-19
coronavirus disease 2019
SARS-CoV-2
severe acute respiratory syndrome coronavirus 2
ARDS
acute respiratory distress syndrome
ISS
injury severity score
SAPS2
Simplified Acute Physiology Score
TBI
Traumatic brain injury
ICU
intensive care unit

Declarations

ETHICS

Given the retrospective nature of the study and according to French law, the TraumaBase group obtained approval for this study, including use of data retrospectively, from the Institutional Review Board (Comité de Protection des Personnes, Paris VI, Pitié, president Pr Laurent Lacapelle, Bâtiment de la Force, 47 Boulevard de l”Hôpital, 75651 Paris Cedex 13, 28 November 2012) which is equivalent to an Ethical Committee and from the Advisory Committee for Information Processing in Health Research (Comité consultatif sur le traitement de l’information en matière de recherche dans le domaine de la santé,

authorisation 11.305bis) and from the National Commission for Data Protection (Commission Nationale de l'Informatique et des Libertés, authorisation 911461).

CONSENT FOR PUBLICATION

Not applicable

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the Traumabase group but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Traumabase group.

COMPETING OF INTERESTS

TG reports personal fees from Laboratoire du Biomédicament Français, outside the submitted work

FINANCIAL SUPPORT

None

AUTHORS' CONTRIBUTIONS

All authors have made substantial contributions to this work and have approved the final version of the manuscript.

Data collection and quality control: All Authors. Concept and design: JDM, AJ, CG, TG, JP, TC, JB. Statistical analysis: YB, CC. Interpretation of data: JDM, AJ, CG, MW, MB, TG, TC JP, CC, YB. Writing original draft: JDM, AJ, CG JP, MW, MB, TG, TC, QM, EA, JB, VL, PL

Writing review and editing: all authors.

ACKNOWLEDGMENT

The authors are indebted to all persons (data scientists, engineers, consultants, physicians) who are involved in the Traumatrix project. We would like to thank specially Ikken Mariam and Gouin Mathilde for their commitment to the coordination of the COVITRAUMA study.

References

1. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. févr 2020;395(10223):497-506.
2. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. The Lancet. févr 2020;395(10223):470-3.

3. Bauer J, Brüggmann D, Klingelhöfer D, Maier W, Schwettmann L, Weiss DJ, et al. Access to intensive care in 14 European countries: a spatial analysis of intensive care need and capacity in the light of COVID-19. Intensive Care Med. nov 2020;46(11):2026-34.
4. Gauss T, Pasquier P, Joannes-Boyau O, Constantin J-M, Langeron O, Bouzat P, et al. Preliminary pragmatic lessons from the SARS-CoV-2 pandemic in France. Anaesth Crit Care Pain Med. 2020;39(3):329-32.
5. Pullano G, Valdano E, Scarpa N, Rubrichi S, Colizza V. Evaluating the effect of demographic factors, socioeconomic factors, and risk aversion on mobility during the COVID-19 epidemic in France under lockdown: a population-based study. Lancet Digit Health. oct 2020;S2589750020302430.
6. John A, Pirkis J, Gunnell D, Appleby L, Morrissey J. Trends in suicide during the covid-19 pandemic. BMJ. 12 2020;371:m4352.
7. Marijon E, Karam N, Jost D, Perrot D, Frattini B, Derkenne C, et al. Out-of-hospital cardiac arrest during the COVID-19 pandemic in Paris, France: a population-based, observational study. Lancet Public Health. 2020;5(8):e437-43.
8. Kuderer NM, Choueiri TK, Shah DP, Shyr Y, Rubinstein SM, Rivera DR, et al. Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study. The Lancet. juin 2020;395(10241):1907-18.
9. Rosell Ortiz F, Fernández Del Valle P, Knox EC, Jiménez Fábrega X, Navalpotro Pascual JM, Mateo Rodríguez I, et al. Influence of the Covid-19 pandemic on out-of-hospital cardiac arrest. A Spanish nationwide prospective cohort study. Resuscitation. 10 oct 2020;
10. Elm E von, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 20 oct 2007;335(7624):806-8.
11. Hamada SR, Gauss T, Duchateau F-X, Truchot J, Harrois A, Raux M, et al. Evaluation of the performance of French physician-staffed emergency medical service in the triage of major trauma patients. J Trauma Acute Care Surg. juin 2014;76(6):1476-83.
12. Baker SP, O'Neill B, Haddon W, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma. mars 1974;14(3):187-96.
13. Le Gall JR. A new Simplified Acute Physiology Score (SAPS II) based on a European/North American multicenter study. JAMA J Am Med Assoc. 22 déc 1993;270(24):2957-63.
14. Roquet F, Neuschwander A, Hamada S, Favé G, Follin A, Marrache D, et al. Association of Early, High Plasma-to-Red Blood Cell Transfusion Ratio With Mortality in Adults With Severe Bleeding After Trauma. JAMA Netw Open. 04 2019;2(9):e1912076.
15. Boyd CR, Tolson MA, Copes WS. Evaluating trauma care: the TRISS method. Trauma Score and the Injury Severity Score. J Trauma. avr 1987;27(4):370-8.
16. Lefrant J-Y, Fischer M-O, Potier H, Degryse C, Jaber S, Muller L, et al. A national healthcare response to intensive care bed requirements during the COVID-19 outbreak in France. Anaesth Crit Care Pain Med. 5 oct 2020;

17. Gauss T, Ageron F-X, Devaud M-L, Debaty G, Travers S, Garrigue D, et al. Association of Prehospital Time to In-Hospital Trauma Mortality in a Physician-Staffed Emergency Medicine System. JAMA Surg. 1 déc 2019;154(12):1117.
18. Hamada SR, Delhaye N, Degoul S, Gauss T, Raux M, Devaud M-L, et al. Direct transport vs secondary transfer to level I trauma centers in a French exclusive trauma system: Impact on mortality and determinants of triage on road-traffic victims. PloS One. 2019;14(11):e0223809.

Figures

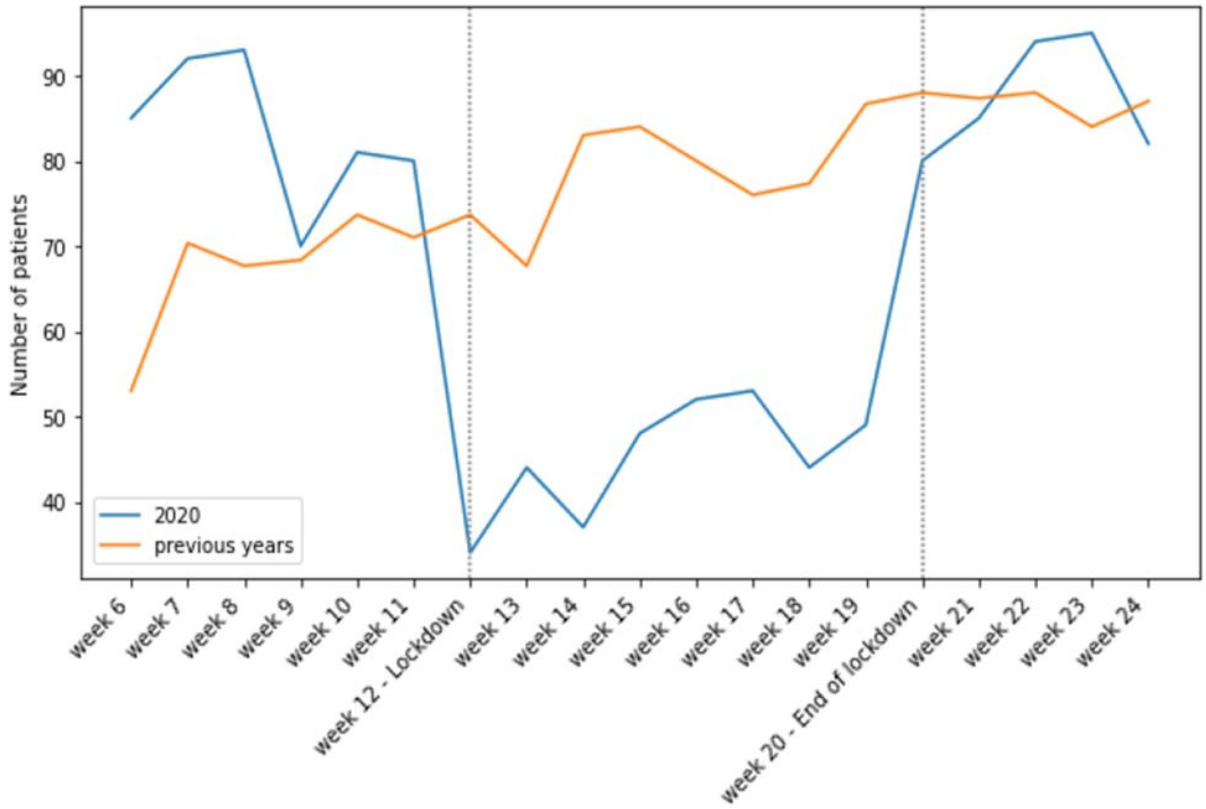

Figure 1

Weekly number of patients admitted in Traumacenter in 2020 and compared with previous years (average of 2017-2019)

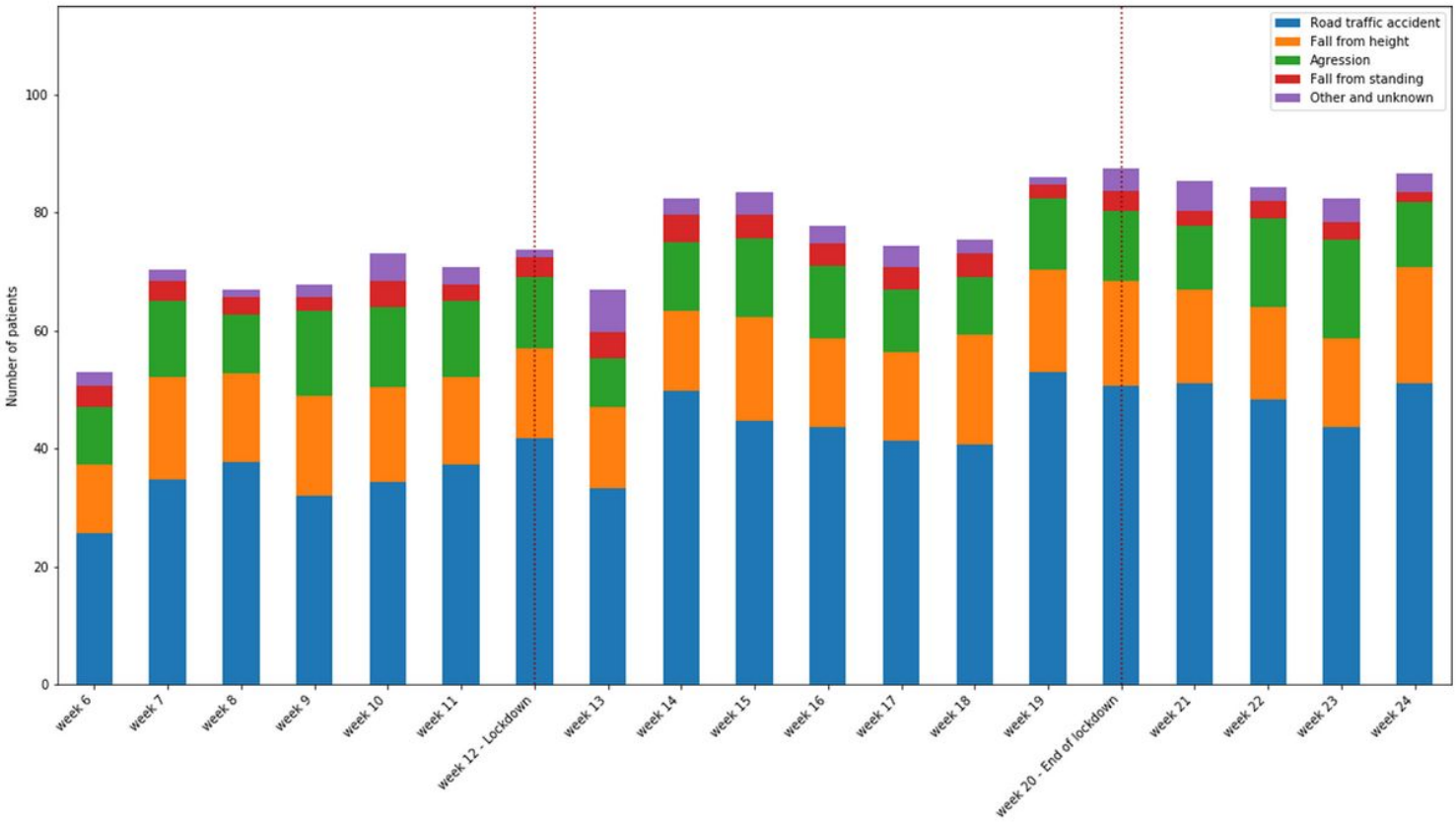

Figure 2

Weekly mechanism of trauma admitted in Traumacenter in 2020

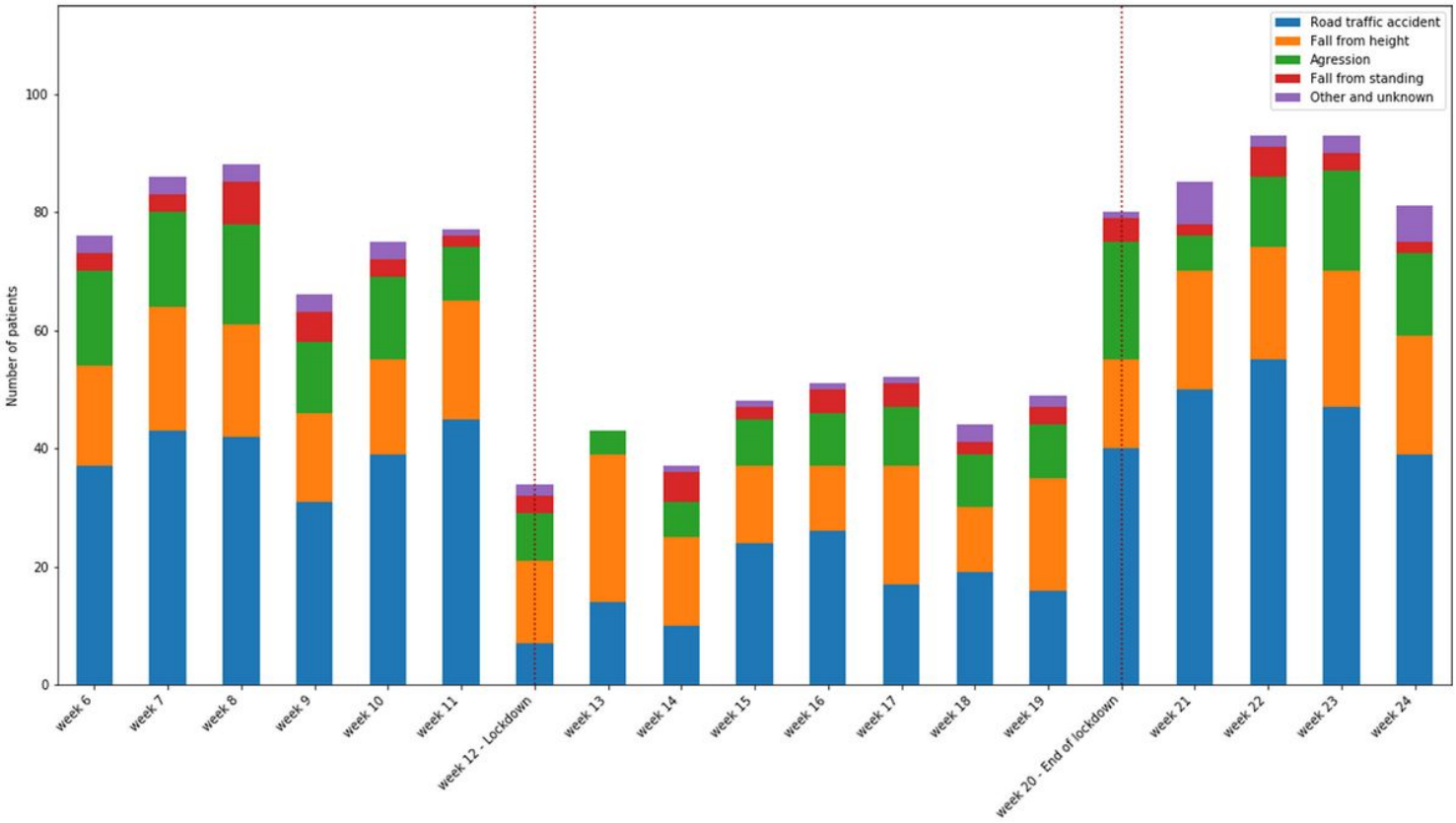

Figure 3

Weekly mechanism of trauma admitted in Traumacenter during the previous years (average of 2017 to 2019)

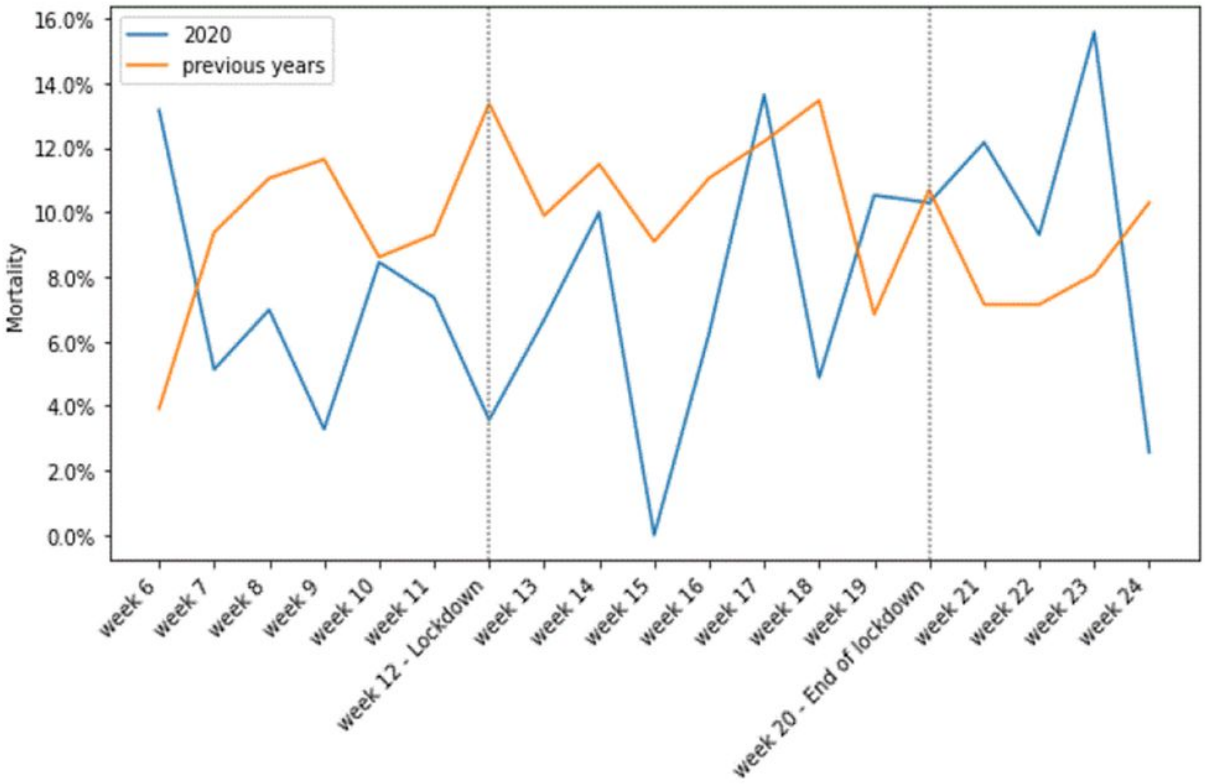

Figure 4

Weekly mortality in 2020 and compared to the previous years (average of 2017-2019)

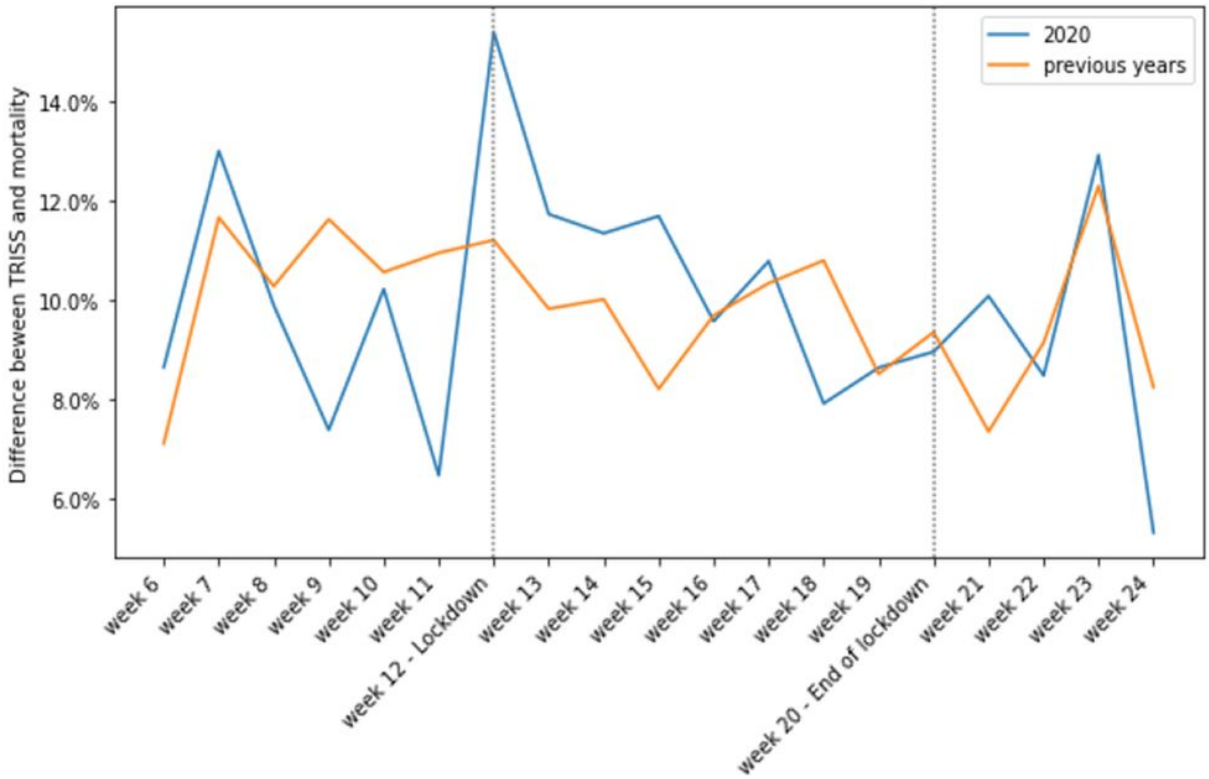

Figure 5

Weekly mortality in 2020 and compared to the previous years (average of 2017-2019)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Supplementarymaterialscovitrauma.docx