Archives of Academic Emergency Medicine. 2024; 12(1): e12

OPEN ACCESS

REVIEW ARTICLE

The Impact of The COVID-19 Pandemic on Hospital Admissions Due to Road Traffic Crashes; a Systematic Review and Meta-Analysis

Neda Kabiri[1], Amin Abbasi[2], Fariba Pashazadeh[1], Sakineh Hajebrahimi[1,3], Hassan Soleimanpour[4]*

1. Research Center for Evidence-based Medicine, Iranian EBM Centre: A JBI Centre of Excellence, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran
2. Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
3. Urology Department, Helsinki University, Helsinki, Finland
4. Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

Received: September 2023; Accepted: October 2023; Published online: 17 November 2023

Abstract: **Introduction:** During the unprecedented COVID-19 lockdowns, road traffic was limited, and a change in the traumatic emergency admission pattern was anticipated. We conducted the current systematic review and meta-analysis to assess the impact of the COVID-19 pandemic on hospital admissions due to road traffic crashes. **Methods:** This systematic review and meta-analysis was conducted based on the Joanna Briggs Institute (JBI) instructions. The following databases were searched: PubMed, ISI Web of Knowledge, Scopus, ProQuest, and the Cochrane Library. Two independent reviewers screened articles based on the inclusion criteria for the review and assessed the methodological quality of the included studies using an appropriate appraisal checklist, introduced by the JBI, based on the study type. The meta-analysis was performed using Comprehensive meta-analysis (CMA) software. Considering the heterogeneity among studies, a random effect model was adopted to estimate the pooled effect with 95% confidence interval (CI) for binary outcomes. **Results:** A total of 13 studies were included in this systematic review, and all of them were considered for meta-analysis. According to the meta-analysis, differences in hospital admission rates during the COVID-19 pandemic and one year before this pandemic were statistically significant [RR: 0.685 CI 95% (0.578 -0.813) p<0.00001]. The heterogeneity assessment of the included studies in the meta-analysis showed high heterogeneity (I2=78%, p<0.00001). **Conclusion:** The results of this systematic review showed that the COVID-19 pandemic dramatically reduced the number of hospital admissions related to road traffic crashes because of both quarantines and lifestyle changes. Health policymakers and top health managers might use the results of this systematic review in similar contexts in the future.

Keywords: Accidents, traffic; COVID-19; systematic review; meta-analysis

Cite this article as: Kabiri N, Abbasi A, Pashazadeh F, et al. The Impact of The COVID-19 Pandemic on Hospital Admissions Due to Road Traffic Crashes; a Systematic Review and Meta-Analysis. Arch Acad Emerg Med. 2024; 12(1): e12. https://doi.org/10.22037/aaem.v12i1.2157.

1. Introduction

The world has been coping with the multi-dimensional consequences of the 2019 Coronavirus disease (COVID-19) pandemic for more than 3 years. Emerging infectious diseases caused by new pathogens appear regularly and their frequency and deadliness are increasing (1). COVID-19 was highly contagious in nature, and when it first emerged, it spread rapidly throughout the world, causing a pandemic and challenging global health (2).

With the rapid and wide expansion of COVID-19, healthcare systems became overwhelmed and had to change their functioning patterns. There was an unprecedented rate of COVID-19 patients admitted to emergency departments and special care units, worsening the prior overcrowded situation of hospitals (3, 4). To adapt to the new situation, elective surgeries were postponed, and more hospital beds were allocated to corona patients (5).

Various measures were undertaken to slow the spread of the virus and decrease its contamination rate. Obligatory use of masks, maintaining social distancing, follow-up measures for COVID-19 patients, and vaccination were in place in many countries. In addition, public places such as clubs, churches, schools, and universities were closed, and lockdowns were enforced (3, 6). Because of the lockdowns, road traffic was limited, and a change in the traumatic emergency

***Corresponding Author:** Hassan Soleimanpour; Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. Tel: 00989141164134, Email: h.soleimanpour@gmail.com, ORCID: https://orcid.org/0000-0002-1311-4096.

admission pattern was anticipated afterward (7, 8).

There was a 40 percent decrease in traumatic admissions and a 60 percent decrease in sports and traffic trauma admissions in a study, while domestic violence increased by 17 percent during the pandemic (9). In Nishant Goyal's study, the number of patients with head trauma decreased significantly, while the severity of trauma was higher (10). Hampton et al. demonstrated that trauma patients with orthopedic injuries decreased, but traumas leading to hand nerve injuries were higher during the pandemic (11). In addition, a significant decrease in road traffic trauma, especially trauma due to alcohol drinking, head trauma, and fractures, was demonstrated in a study conducted in southern India (12). In contrast, Min Ho Lee's study in China found no significant decrease in traffic crashes during the pandemic (13).

Traffic trauma is a major cause of death and places a considerable burden on both victims and healthcare systems. Understanding traffic traumas and their admission patterns during lockdowns such as the COVID-19 pandemic would help health policymakers and top managers better reallocate medical resources during similar contexts.

There are contrasting findings in the primary studies regarding traffic trauma emergency admissions during the COVID-19 pandemic. A meta-analysis could resolve this issue, but this has not been done previously. Before conducting this systematic review, we searched the PROSPERO (International Prospective Register of Systematic Reviews), the Cochrane Library, and MEDLINE for published or ongoing meta-analyses in this field, there weren't any related systematic reviews and meta-analyses with the same eligibility criteria for this review. Therefore, we conducted the current systematic review and meta-analysis to assess the impact of the COVID-19 pandemic on hospital admissions due to road traffic crashes.

2. Methods

2.1. Study design and setting

This systematic review and meta-analysis was conducted to evaluate the impact of the COVID-19 pandemic on hospital admissions due to road traffic crashes. We adhered to the JBI manual for evidence synthesis in conducting this systematic review (14). In this systematic review, we included studies with adult participants over 16 years old, who had a crash with one type of vehicle or as a pedestrian during the COVID-19 pandemic and were admitted to the hospital.

This review was limited to studies published in English. Since the emergence of COVID-19 occurred in December 2019, the search strategy was limited to studies published between December 2019 and January 13, 2023. Quantitative original studies with any design, including but not limited to cohort, case-control, and cross-sectional were included. We excluded articles based on the following criteria: studies considering children's crashes, studies that did not compare the number of crashes before COVID-19 lockdowns and during the lockdowns, non-English-language studies, non-original articles, and reviews.

2.2. PECO framework of study

• Participants: Studies with adult participants over 16 years old who had a crash with one type of vehicle or as a pedestrian and were admitted to the hospital.

• Exposure: The COVID-19 pandemic was considered an exposure in this systematic review.

• Comparison: Studies that reported hospital admissions due to road traffic crashes one year before COVID-19 began were considered for comparison.

• Outcome: The rate of hospital admission was considered an outcome in this review.

2.3. Search strategy

The search strategy aimed to consider only published studies. A preliminary limited search of MEDLINE was undertaken to develop a search strategy. The main keywords for the search, based on the research question, were traffic accident, traffic collision, traffic crash, traffic injury, traffic wound, traffic traumas, road traffic, hospital admission, COVID-19, 2019-nCoV, coronavirus, 2019-CoV, SARS-nCoV-2, and SARS-CoV-2. Based on the main identified keywords, both free text and controlled vocabularies were searched across the included databases. The reference list of all the included studies was screened for any additional research. We searched the electronic databases PubMed, ISI Web of Knowledge, Scopus, ProQuest, and the Cochrane Library (from December 29, 2019 and January 13, 2023). The full search strategy for each database is indicated in supplementary file 1.

2.4. Study selection

After collecting and uploading all the identified citations into Endnote X8 software, we removed duplicates. Two independent reviewers screened the titles and abstracts based on the inclusion criteria for the review. The studies that met the inclusion criteria were retrieved in full and assessed in detail.

2.5. Assessment of methodological quality

Two independent reviewers (NK, AA) assessed the methodological quality of the included studies using an appropriate appraisal checklist, introduced by the JBI, based on the study (15). Any disagreements between the reviewers were resolved through discussion; when there was confusion, a third reviewer (HS) independently appraised the paper. Papers with a score of 70% and above were regarded as having a low risk of bias. This definition was based on consensus between the authors, who acknowledged that any such cutoffs are arbitrary. No studies were excluded based on quality.

2.6. Data extraction

Two independent reviewers (NK, AA) extracted data from the included articles using the standardized data extraction tool from JBI (14). Based on this tool, the extracted data included study citation, country, study design, number of participants, number of admissions due to road crash trauma before and during the lockdown, and overall results. Any disagreement among the reviewers was resolved through discussion.

2.7. Data analysis

Studies with sufficient data to examine the number of admissions due to road crash trauma before and during COVID-19 were included in the meta-analysis. The statistical analysis was performed using the comprehensive meta-analysis (CMA) software.

Considering the heterogeneity among studies, a random effect model was adopted to estimate the pooled effect with 95% confidence interval (CI) for binary outcomes. The I2 statistic and Cochran Q test were used to assess statistical heterogeneity. To identify and assess sources of heterogeneity, we planned priori subgroup analyses to assess road traffic crashes based on the geographical context. To investigate publication bias, we used a funnel plot and Egger's test.

3. Results

3.1. Study inclusion

The initial search of databases yielded 1225 potentially relevant articles. A total of 512 articles were recognized and removed as duplicates. Of the 713 records screened, 650 were excluded after reviewing titles and abstracts. Another 50 were excluded at the full-text review stage due to no access to full text (n=14), non-English full text (n=16), no trauma-related admission (n=18), and modeling study (n=2). Finally, as shown in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram in Figure 1, a total of 13 studies were included in this systematic review, and all of them were considered for meta-analysis.

3.2. The main characteristics of the included studies

Among the 13 articles included in this systematic review, five were published in 2020 (15-19), and eight were published in 2021 (20-27). The design of most of the included studies were cohort (15, 16, 18-25, 27). The other two studies had cross-sectional (17) and quasi-experimental (26) designs. Of the 13 included studies, three were conducted in Italy (15, 16, 21). The remaining 10 studies were conducted in Australia (17), USA (18), Spain (19), Japan (20), Turkey (22), New Zealand (23), France (24), Austria (25), Puerto Rico (26), and UK (27). In the 13 studies, the number of total participants before COVID-19 was 23815, and the number of participants during the COVID-19 pandemic was 11464. The main characteristics of the included studies are shown in Table 1.

3.3. Quality assessments

The thirteen included studies were critically appraised using JBI checklists, based on the study design. According to the results of this apprisal, the only quasi-experimental study (26) qualified as good quality for inclusion in the analysis, which was also true for the only cross-sectional included study (17). The quality of these studies involved the least biases. The results of the quality assessment are indicated in Table 2.

3.4. Results of meta-analysis

All 13 included studies were meta-analyzed to determine the effect of the COVID-19 pandemic on the ED admission rates in hospitals compared with the admission rates during the non-COVID period. According to the meta-analysis, the difference in the admission rates due to road traffic crashes was statistically significant during the COVID-19 pandemic when compared to pre-COVID-19 era [RR: 0.685 CI 95% (0.578 - 0.813) p<0.00001] (figure 2). In addition, the pooled hospital admission rates due to the road traffic crashes before and during the COVID-19 pandemic were [admission rate: 0.192 CI 95% (0.076 - 0.408) p=0.008] and [admission rate: 0.121 CI 95% (0.055 - 0.245) p<0.00001], respectively. The heterogeneity assessment of the included studies in the meta-analysis showed high heterogeneity (I2=78%, p<0.00001). Furthermore, the included studies were assessed regarding publication bias, which showed high dispersion in the distribution of retrieved studies presented in a funnel plot (figure 3).

4. Discussion

The current systematic review was conducted to determine differences in trauma admission rates before and during the COVID-19 period. The meta-analysis of the studies demonstrated a significant decrease in the trauma admission rate during the COVID-19 period. Due to the COVID-19 lockdowns, it was anticipated that more people would stay at home and would probably use vehicles less often. Following the COVID-19 lockdowns, people were forced to stay inside or they preferred to stay in their homes to decrease the chance of virus contamination. Public places such as schools and shopping centers were also closed, which decreased the use of vehicles (28).

In Lin's study, lockdowns decreased the amount of road traffic, which correlated with a decrease in new COVID-19 cases along with social distancing policies (29). In China, it was also demonstrated that government-enforced laws could decrease public transportation even to zero on the streets (30). In another study carried out in Florida, it was also shown

that there was a 47.5% decrease in road traffic crashes during the COVID-19 period, but the rate was not the same in urban and rural areas (31). Applying social distancing and quarantine policies led to a reduction in road traffic crashes, which reduced patients' admission to hospital emergency departments. This can also be attributed to the reorganization of hospital activities and the focus of care on COVID-19 patients, the reduction of hospital manpower due to illness and infection, and the reluctance of people to receive hospital care. Furthermore, there is a possibility that because of the fear of virus contamination, some minor traffic incident victims did not attend hospitals and preferred to stay home. Moreover, some studies have even reported a decrease in the number of patients who needed immediate medical care attending hospitals.

Considering the effect of the COVID-19 period and subsequent lockdowns on road traffic crashes, a decrease in trauma cases related to road traffic crashes attending hospitals was probable. According to Ghafil et al.'s study, blunt trauma resulting from road traffic crashes decreased from 22.7% to 21.6% of total trauma patients during lockdowns (5). Kamine et al. investigated trauma and traffic trauma patients' attendance during the COVID-19 period. In their study, it was reported that trauma patient attendance decreased by 45.1%, while traffic trauma patients had an 80.5% decrease (32). Moreover, a decrease from 64.8% of the cases to 62.2% was demonstrated in traffic head trauma patients' attendance during lockdowns (33). In the conditions of a crisis, such as the COVID-19, it seems that it is necessary to apply the policy of reducing the admission of elective patients and assigning hospital beds to patients with COVID-19 infection.

In contrast to the results of our study, which indicated a decrease in traffic trauma admissions during the COVID-19 period, some studies did not report the same pattern. One study demonstrated that despite the lockdowns' effect on traffic, people used bicycles for transportation. As a result, bicycle traffic trauma showed a marked increase during that period (34). A retrospective study reported a decrease in traffic trauma patients during the COVID-19 lockdown period compared to similar periods in previous years, but the results were also not significant. It is possible that, despite using cars less often and having fewer minor traffic incidents, people did not change their careless driving habits, and the major cycle and car crashes remained considerable (35). It seems that after lifting some of the travel restrictions with reduction in the number of new COVID-19 cases, the world witnessed an increase in the number of trips and, unfortunately, an increase in the number of traffic crashes and traumas. Also, the policy of traffic restrictions can be considered as one of the psychological impacts of the pandemic in society. Patterns of hospital admissions due to road traffic crashes differ during the pandemic because of both quarantines and lifestyle changes. Health policymakers and top health managers might use the results of this study in similar contexts in the future.

5. Limitations

This study had some limitations. First, few studies were available for inclusion. At the time of performing this review, the topic of COVID-19 was novel and most studies might have been under review or in the pre-publishing process. However, we adopted a systematic search strategy to identify all related studies, and this review, to our knowledge, is the first meta-analysis of the effect of COVID-19 on hospital admission due to road crashes. Another limitation of this review was that most of the included studies were of low quality, as this study was conducted during the COVID-19 pandemic and most of the studies of this era were of low quality.

Due to this limitation, we decided not to exclude studies of low quality and provide their results in the final tables and meta-analysis. Another limitation was the lack of subgroup analysis for the geographical sites. It would be better to subgroup studies with a broad geographic scope, to get a more comprehensive understanding of the effect of COVID-19 on hospital admissions; however, this was an inescapable problem given the small number of published studies in this field at the time. One of the limitations of the study was excluding non-English studies due to the lack of expertise in translating other languages. Since the beginning of the pandemic was in China, probably we have missed some related Chinese studies.

6. Conclusion

The results of this systematic review showed that the COVID-19 pandemic dramatically reduced the number of hospital admissions related to road traffic crashes. Providing training and public awareness about driving accidents and driving risks, especially in special conditions such as the COVID-19 era, can help increase drivers' awareness and safe driving behaviors.

7. Declarations

7.1. Acknowledgments

We wish to thank the Road Traffic Injury Research Center for financial support and the Research Center of Evidence-based Medicine at Tabriz University of Medical Sciences, Tabriz, Iran, for technical support. We would like to appreciate the cooperation of the Clinical Research Development Unit, Imam Reza General Hospital, Tabriz, Iran, in conducting this research. This article was written based on dataset of Amin Abbasi's Medical degree thesis entitled, "The impact of the

COVID-19 pandemic on hospital admissions due to road traffic crash: A systematic review and meta-analysis". This study was registered in Tabriz University of Medical Sciences (Code No: 68931).

7.2. Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

7.3. Funding and supports

This research was financially supported by the Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

7.4. Authors' contribution

HS and NK supervised the whole study. FP conducted a systematic search and meta-analysis. NK, SH and AA screened the articles, extracted the data, and assessed the methodological quality of the studies. AA prepared the early draft of the manuscript. All authors confirmed the final manuscript.

7.5. Using artificial intelligent chatbots

Artificial intelligence was not used in any part of conducting the current study.

7.6. Ethical approval

The ethics committee of Tabriz University of Medical Sciences approved the study (IR.TBZMED.REC.1401.064).

References

1. Lefrançois T, Malvy D, Atlani-Duault L, Benamouzig D, Druais P-L, Yazdanpanah Y, Delfraissy J-F, Lina B. After 2 years of the COVID-19 pandemic, translating One Health into action is urgent. Lancet. 2023;401(10378), 789-794.
2. Shahsavarinia K, Amiri P, Mousavi Z, Gilani N, Saadati M, Soleimanpour H. Prediction of PTSD related to COVID-19 in emergency staff based on the components of self-compassion and perceived social support. BMC Psychiatry. 2022;22(1):368.
3. Doucette ML, Tucker A, Auguste ME, Watkins A, Green C, Pereira FE, et al. Initial impact of COVID-19's stay-at-home order on motor vehicle traffic and crash patterns in Connecticut: an interrupted time series analysis. Inj Prev. 2021;27(1):3-9.
4. Rahmani F, Rezazadeh F, Ala A, Soleimanpour M, Mehdizadeh R, Soleimanpour H. Evaluation of Overcrowding of Emergency Department in Imam Reza Hospital in 2015 by Implementing 2 Scales: NEDOCS and EDWIN. Iran Red Crescent Med J. 2017;19(6):e15609.
5. Ghafil C, Matsushima K, Ding L, Henry R, Inaba K. Trends in Trauma Admissions During the COVID-19 Pandemic in Los Angeles County, California. JAMA Netw Open. 2021;4(2):e211320.
6. Bagi HM, Soleimanpour M, Abdollahi F, Soleimanpour H. Evaluation of clinical outcomes of patients with mild symptoms of coronavirus disease 2019 (COVID-19) discharged from the emergency department. PLoS One. 2021;16(10):e0258697.
7. Sarbazi E, Sadeghi-Bazargani H, Farahbakhsh M, Ala A, Soleimanpour H. Psychometric properties of trust in trauma care in an emergency department tool. Eur J Trauma Emerg Surg. 2023.
8. Fahy S, Moore J, Kelly M, Flannery O, Kenny P. Analyzing the variation in volume and nature of trauma presentations during COVID-19 lockdown in Ireland. Bone Jt Open. 2020;1(6):261-6.
9. Goyal N, Swain SK, Gupta K, Chaturvedi J, Arora RK, Sharma SK. "Locked up inside home" - Head injury patterns during coronavirus disease of 2019 pandemic. Surg Neurol Int. 2020;11:395.
10. Hampton M, Clark M, Baxter I, Stevens R, Flatt E, Murray J, et al. The effects of a UK lockdown on orthopedic trauma admissions and surgical cases: A multicenter comparative study. Bone Jt Open. 2020;1(5):137-43.
11. Hazra D, Jindal A, Fernandes JP, Abhilash KP. Impact of the Lockdown due to COVID-19 Pandemic on the Spectrum and Outcome of Trauma in India. Indian J Crit Care Med. 2021;25(3):273-8.
12. Lee MH, Jang SR, Lee TK. Comparative Analysis of COVID-19 Outbreak and Changes in Neurosurgical Emergency Patients. J Korean Neurosurg Soc. 2022;65(1):130-7.
13. Aromataris E, Munn Z, editors. JBI Manual for Evidence Synthesis [internet]. Adelaide, JBI; 2020. Available from: https://synthesismanual.jbi.global.
14. JBI. Joanna Briggs Institute Reviewers' Manual: 2014 edition/Supplement methodology for JBI systematic reviews. Adelaide, Australia: JBI; 2014. Available from: https://reviewersmanual.joannabriggs.org/.
15. Dolci A, Marongiu G, Leinardi L, Lombardo M, Dessì G, Capone A. The Epidemiology of Fractures and Muskulo-Skeletal Traumas During COVID-19 Lockdown: A Detailed Survey of 17.591 Patients in a Wide Italian Metropolitan Area. Geriatr Orthop Surg Rehabil. 2020;11:2151459320972673.
16. Gumina S, Proietti R, Polizzotti G, Carbone S, Candela V. The impact of COVID-19 on shoulder and elbow trauma: an Italian survey. J Shoulder Elbow Surg. 2020;29(9):1737-42.
17. Jacob S, Mwagiru D, Thakur I, Moghadam A, Oh T, Hsu J. Impact of societal restrictions and lockdown on trauma

admissions during the COVID-19 pandemic: a single-center cross-sectional observational study. ANZ J Surg. 2020;90(11):2227-31.
18. Leichtle SW, Rodas EB, Procter L, Bennett J, Schrader R, Aboutanos MB. The influence of a statewide "Stay-at-Home" order on trauma volume and patterns at a level 1 trauma center in the united states. Injury. 2020;51(11):2437-41.
19. Nuñez JH, Sallent A, Lakhani K, Guerra-Farfan E, Vidal N, Ekhtiari S, Minguell J. Impact of the COVID-19 Pandemic on an Emergency Traumatology Service: Experience at a Tertiary Trauma Centre in Spain. Injury. 2020;51(7):1414-18.
20. Bekki H, Arizono T, Tagata R, Inokuchi A, Hamada T, Imamura R. Changes in a Single Institution's Orthopedic Hospitalization Service in Japan Owing to COVID-19 in 2020. Cureus. 2021;13(4):e14410.
21. Giudici R, Lancioni A, Gay H, Bassi G, Chiara O, Mare C, et al. Impact of the COVID-19 outbreak on severe trauma trends and healthcare system reassessment in Lombardia, Italy: an analysis from the regional trauma registry. World J Emerg Surg. 2021;16(1):39.
22. Kalem M, Kocaoğlu H, Merter A, Karaca MO, Özbek EA, Kınık HH. Effects of COVID-19 pandemic curfew on orthopedic trauma in a tertiary care hospital in Turkey. Acta Orthop Traumatol Turc. 2021;55(3):191-5.
23. Mcguinness MJ, Harmston C. Association between COVID-19 public health interventions and major trauma presentation in the northern region of New Zealand. ANZ J Surg. 2021;91(4):633-8.
24. Moyer JD, James A, Gakuba C, Boutonnet M, Angles E, Rozenberg E, et al. Impact of the SARS-COV-2 outbreak on epidemiology and management of major traumain France: a registry-based study (the COVITRAUMA study). Scand J Trauma Resusc Emerg Med. 2021;29(1):51.
25. Nia A, Popp D, Diendorfer C, Apprich S, Munteanu A, Hajdu S, et al. Impact of lockdown during the COVID-19 pandemic on number of patients and patterns of injuries at a level I trauma center. Wiener klinische Wochenschrift. 2021;133(7-8):336-43.
26. Ruiz-Medina PE, Ramos-Meléndez EO, Cruz-De La Rosa KX, Arrieta-Alicea A, Guerrios-Rivera L, Nieves-Plaza M, et al. The effect of the lockdown executive order during the COVID-19 pandemic in recent trauma admissions in Puerto Rico. Inj Epidemiol. 2021;8(1):22.
27. Sinha S, Toe KKZ, Wood E, George KJ. The impact of COVID-19 on neurosurgical head trauma referrals and admission at a tertiary neurosurgical centre. J Clin Neurosci. 2021;87:50-4.
28. Onyeaka H, Anumudu CK, Al-Sharify ZT, Egele-Godswill E, Mbaegbu P. COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. Sci Prog. 2021;104(2):368504211019854.
29. Lin S, Lin R, Yan N, Huang J. Traffic control and social distancing evidence from COVID-19 in China. PLoS One. 2021;16(6):e0252300.
30. Zhang Z, Fu D, Liu F, Wang J, Xiao K, Wolshon B. COVID-19, traffic demand, and activity restriction in China: A national assessment. Travel Behav Soc. 2023;31:10-23.
31. Parr S, Wolshon B, Renne J, Murray-Tuite P, Kim K. Traffic Impacts of the COVID-19 Pandemic: Statewide Analysis of Social Separation and Activity Restriction. Natural Hazards Review. 2020;21(3):04020025.
32. Kamine TH, Rembisz A, Barron RJ, Baldwin C, Kromer M. Decrease in Trauma Admissions with COVID-19 Pandemic. West J Emerg Med. 2020;21(4):819-22.
33. Karthigeyan M, Dhandapani S, Salunke P, Sahoo SK, Kataria MS, Singh A, et al. The collateral fallout of COVID19 lockdown on patients with head injury from north–west India. Acta Neurochir (Wien). 2021;163(4):1053-60.
34. Li J, Zhao Z. Impact of COVID-19 travel-restriction policies on road traffic accident patterns with emphasis on cyclists: A case study of New York City. Accid Anal Prev. 2022;167:106586.
35. Crenn V, El Kinani M, Pietu G, Leteve M, Persigant M, Toanen C, et al. Impact of the COVID-19 lockdown period on adult musculoskeletal injuries and surgical management: a retrospective monocentric study. Sci Rep. 2020;10(1):22442.

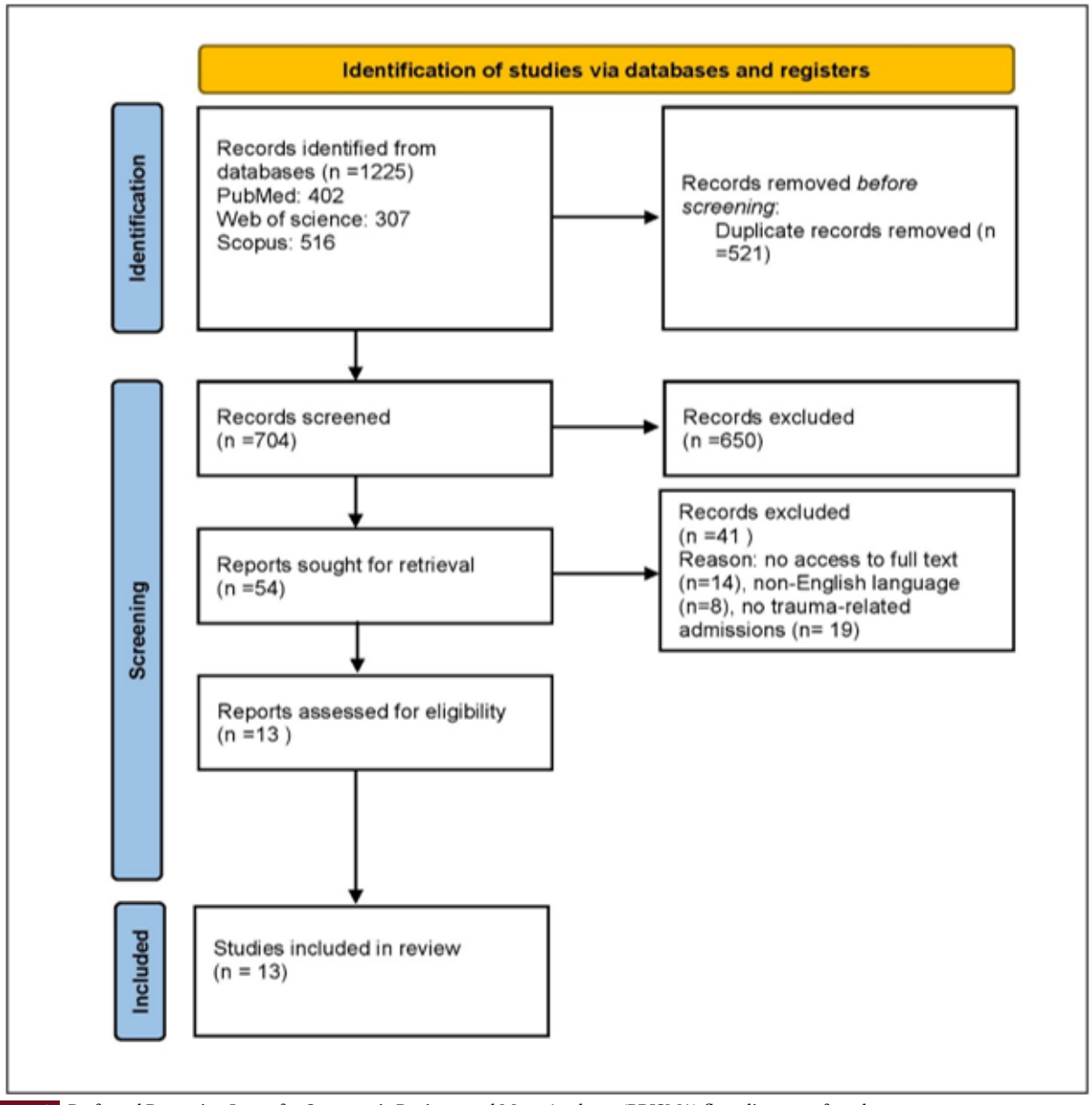

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of study.

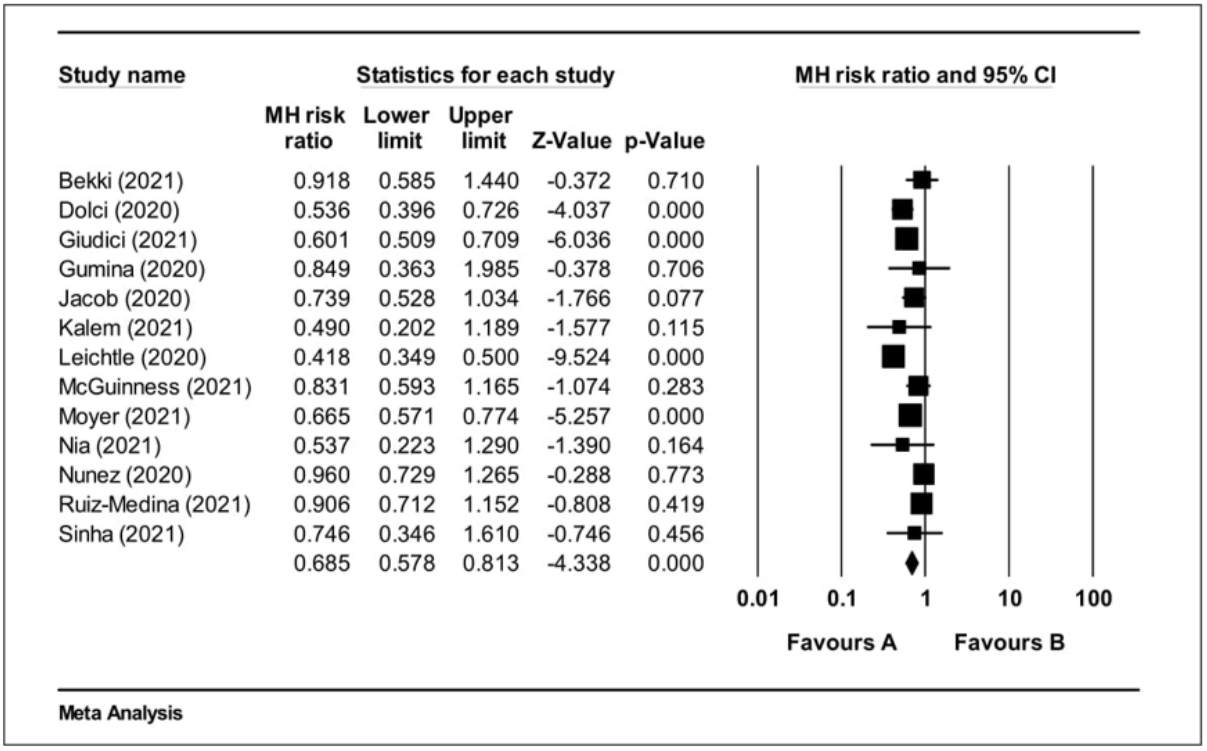

Figure 2: Forest plot of comparison of hospital admissions due to road traffic crashes during COVID-19 period versus non-COVID-19 period. CI: confidence interval.

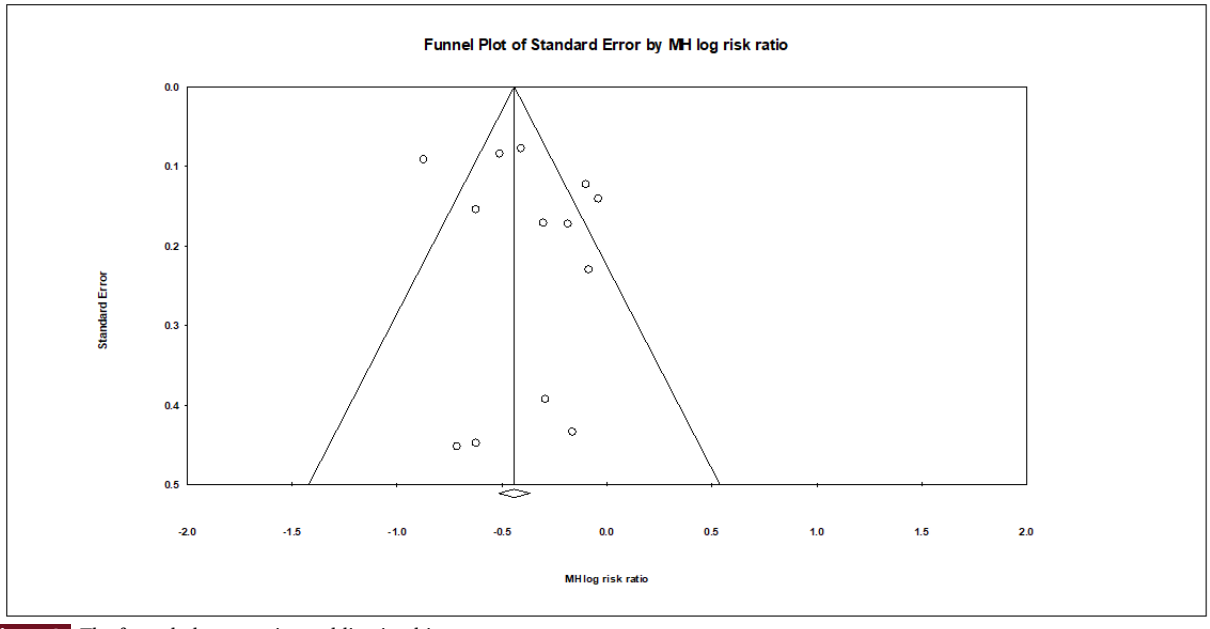

Figure 3: The funnel plot assessing publication bias.

Table 1: Main characteristics of included studies

Author (year) Country	Setting	Type of study	Age in 2019	Age in 2020	Gender in 2019	Gender in 2020	Lockdown period	Sample size in 2019	Sample size in 2020	Time frame (month)*	Number of admissions in 2019**	Number of admissions during COVID-19**
Bekki (2021) Japan	Kyushu Central Hospital	Cohort	67.5± 0.5	69.7± 0.5	716 women and 566 men	705 women and 482 men		1282	1187	8 in 2019 8 in 2020	40	34
Dolci (2020) Italy	Trauma centers	Cohort	51	57.5	6588 women and 6154 men	2894 women and 1952 men	10 March to 3 May 2020	12743	4848	2 in 2019 2 in 2020	245	50
Giudici (2021) Italy, Lombardi	Regional level 1 or 2 trauma center	Cohort	43	48	77 women and 248 men	83 women and 262 men		325	345	1.5 in 2019 3 in 2020	196	125
Gumina (2020) Italy, Lombardy	Not stated	Cohort					8 March to 8 April 2020	133	47	1 in 2019 1 in 2020	20	6
Jacob (2020) Australia, Cydny	Level 1 adult major trauma centre	Cross-sectional					1 March to 30 April 2020	126	97	1 in 2019 1 in 2020	58	33
Kalem (2021) Turkey	University Hospital, Department of Orthopedics and Traumatology	Cohort	56.4	54.6	323 women and 385 men	159 women and 202 men	21 March to 1 June 2020	708	361	3 in 2019 3 in 2020	24	6
Leichtle (2020) USA	Level 1 trauma center	Cohort	47	46	260 women	66 women	1 March to 30 April 2020	501	322	1 in 2019 1 in 2020	350	94
McGuinness (2021) New Zealand	Not stated	Cohort	41	49			163	123	3 in 2019 3 in 2020	59	37	
Moyer (2021) France	15 regional trauma centers	Cohort	41.5	43.2			17 March to 10 May 2020	628	361	4 in 2019 4 in 2020	348	133
Nia (2021) Austria	Trauma emergency department of a level 1 trauma cente	r Cohort	42.88 ± 27.31	45.19 ± 26.87	13 women and 37 men	13 women and 30 men		50	43	1 in 2019 1 in 2020	13	6
Nunez (2020) Spain, Barcelona	Tertiary trauma centre	Cohort	54.6	57.5	1194 women and 967 men	1300 women and 1195 men	14 March to 2 April 2020	2161	2495	1 in 2019 1 in 2020	92	102
Ruiz-Medina (2021) Puerto Rico	Tertiary institution for polytrauma patients	Quasi-experimental	42.8 ± 20.1	49.9 ± 21.7	216 women and 762 men	27 women and 122 men	15 March to 15 June 2020	978	150	3 in 2019 3 in 2020	360	50
Sinha (2021) UK	Tertiary neurosurgical centre	Cohort					23 March to 22 April 2020	197	132	1 in 2019 1 in 2020	18	9

* Time frame that the number of admissions happened. ** Number of admissions due to traffic accident during the time frame of study.