

## Brief Communication

# Trends in the number of patients from traffic accidents and the state of emergency

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**Aim:** During the coronavirus disease 2019 pandemic, the number of traffic accidents and injured patients was reported to be lower than that before the pandemic. However, little is known regarding the relationship between periods of the state of emergency and the number of patients who met with traffic accidents.

**Methods:** The numbers of trauma patients and deaths due to traffic accidents in Tokyo and Osaka were collected monthly from the statistics published by the police department. A state of emergency was declared four times in both cities. The number of trauma patients and deaths was compared between the emergency and other periods.

**Results:** The number of monthly patients per 100,000 due to traffic accidents during the state of emergency was significantly lower than that during other periods in Tokyo (16.56 versus 18.20;  $P = 0.008$ ) and Osaka (24.12 versus 28.79;  $P = 0.002$ ). However, the monthly number of deaths during the state of emergency was not significantly different compared with those during the other periods in Tokyo (0.08 versus 0.08;  $P = 0.65$ ) and Osaka (0.10 versus 0.14;  $P = 0.082$ ). A decrease in the number of trauma patients was observed before the emergency period; however, the reduction rate dropped as the period passed.

**Conclusion:** There were significantly fewer trauma patients due to traffic accidents during the state of emergency than during the other periods, with no significant difference in the number of deaths.

**Key words:** Accidents, COVID-19, epidemiology, injuries, Japan, traffic, wounds

## INTRODUCTION

CORONAVIRUS DISEASE 2019 (COVID-19) is a major public health threat that heavily burdens health-care worldwide. In Japan, the supply and demand for emergency medical systems became imbalanced, and the emergency transfer took an extremely long time owing to a large number of patients, especially in Tokyo and Osaka.<sup>1</sup> Public policies and media coverage dramatically maximized their efforts to prevent the spread of COVID-19. Furthermore, the government had declared a state of emergency, which was particularly evident regarding mobility, with passengers dropping to 93% on domestic flights, 98% on international flights, and 95% on Shinkansen bullet trains in Japan. Additionally, the overall highway traffic was reduced by nearly 70%, especially for small cars, which decreased by 79%.<sup>2</sup> As a result, the number of traffic accidents and

injured patients worldwide was reported to be lower than that before the pandemic.<sup>3–8</sup> However, little is known regarding the relationship between the state of emergency and the number of patients who met with traffic accidents. Trauma is a major cause of emergency department visits, and trauma patients from traffic accidents increase the burden for emergency medical systems and emergency departments in terms of patient volume and severity. To allocate medical resources to patients with COVID-19, policymakers must decide whether the state of emergency will contribute to reducing the number of trauma patients. Therefore, we examined the association between periods of the state of emergency and traffic accident-related outcomes in Tokyo and Osaka.

## METHODS

AS TOKYO AND Osaka have the largest populations and highest number of patients with COVID-19 in Japan, we included these two cities in this study. The numbers of trauma patients and deaths due to traffic accidents in Tokyo and Osaka were collected monthly from the statistics published by the National Public Safety Commission and

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National Police Agency.<sup>9</sup> Ethical approval was not required for the secondary analysis of publicly available data.

The COVID-19 pandemic period was defined as the time from January 2020 to December 2021 and the non-pandemic period from January 2018 to December 2019. A state of emergency was declared in Tokyo during the following four periods (260 days; 36% of the duration): April 7, 2020 to May 25, 2020; January 8, 2021 to March 21, 2021; April 25, 2021 to June 20, 2021; and July 12, 2021 to September 30, 2021. For Osaka, a state of emergency was declared during the following four periods (218 days; 30% of the duration): April 7, 2020 to May 21, 2020; January 14, 2021 to February 28, 2021; April 25, 2021 to June 20, 2021; and August 2, 2021 to September 30, 2021.

First, the number of trauma patients and deaths due to traffic accidents was compared between the pandemic and non-pandemic periods. Second, the number of trauma patients and deaths and mortality were compared between the emergency and non-emergency periods. Months with declarations of emergency for at least 21 days were considered as the months of the state of emergency because the difference between the actual period and the set period was ~1% of the duration. Furthermore, the number of patients and the corresponding reduction rates were determined for each period of the state of emergency.

The statistical analysis was performed using the Mann–Whitney *U* test for continuous variables, with median and interquartile ranges, and the  $\chi^2$  test for categorical variables. A *P* value of <0.05 was considered statistically significant. All data were analyzed using R, version 4.0.4 (The R Foundation for Statistical Computing, Vienna, Austria).

## RESULTS

THE TOTAL NUMBER of patients (per 100,000 persons) due to traffic accidents was 37,443 (267.45), 34,777 (248.41), 28,888 (206.34), and 30,836 (220.26) in Tokyo and 40,933 (465.68), 36,664 (417.11), 29,888 (340.02), and 29,560 (336.29) in Osaka during 2018, 2019, 2020, and 2021, respectively. The monthly number of patients per 100,000 during the pandemic period was significantly lower than that during the non-pandemic period in Tokyo (17.75 [16.66–18.89] versus 21.31 [20.07–22.49]; *P* < 0.001) and Osaka (28.32 [27.04–29.59] versus 36.64 [34.85–39.69]; *P* < 0.001) (Fig. 1). The total number of deaths (per 100,000 persons) was 143 (1.04), 133 (0.96), 155 (1.11), and 133 (0.95) in Tokyo and 147 (1.67), 130 (1.48), 124 (1.41), and 140 (1.58) in Osaka during 2018, 2019, 2020, and 2021, respectively. Although a 2% increase and a 4% reduction in the death rate in Tokyo and Osaka, respectively, were observed during the pandemic period, the monthly number of deaths was not significantly different between the pandemic and non-pandemic periods in Tokyo (0.08 [0.06–0.10] versus 0.08 [0.06–0.10]; *P* = 0.97) and Osaka (0.12 [0.10–0.15] versus 0.11 [0.10–0.15]; *P* = 0.87).

The number of patients per 100,000 persons due to traffic accidents during the state of emergency was significantly lower than that during other periods in Tokyo (16.56 [16.21–17.21] versus 18.20 [17.67–19.81]; *P* = 0.008) and Osaka (24.12 [23.53–26.31] versus 28.79 [27.72–30.31]; *P* = 0.002) (Fig. 2). However, the number of deaths due to traffic accidents during the state of emergency remained the same as in those reported during other periods in Tokyo

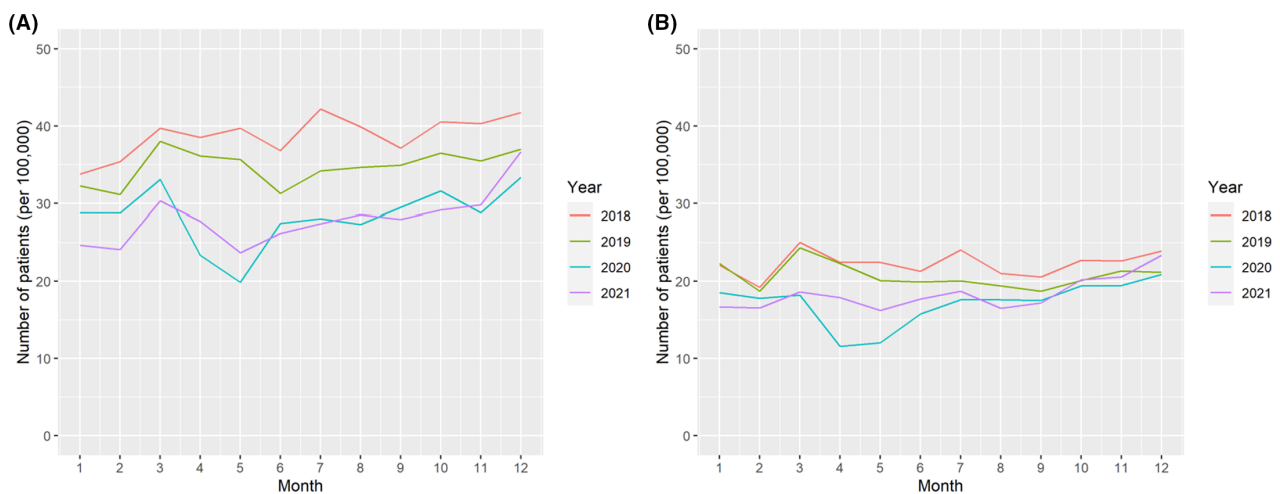
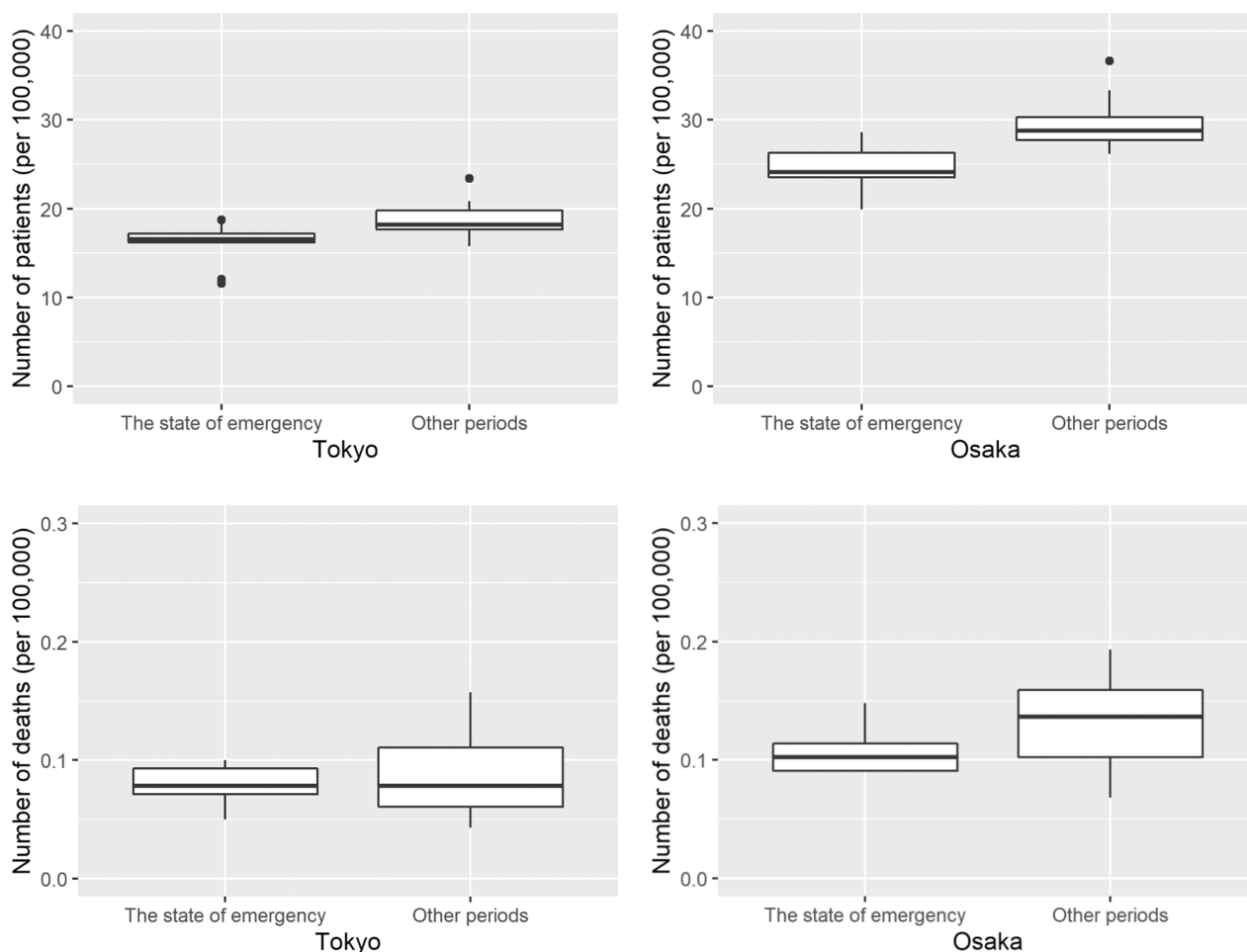


Fig. 1. Number of patients due to traffic accidents by month between 2018 and 2021 in (A) Tokyo and (B) Osaka.



**Fig. 2.** Comparison of the number of patients and deaths due to traffic accidents between the period of the state of emergency and other periods in Tokyo and Osaka.

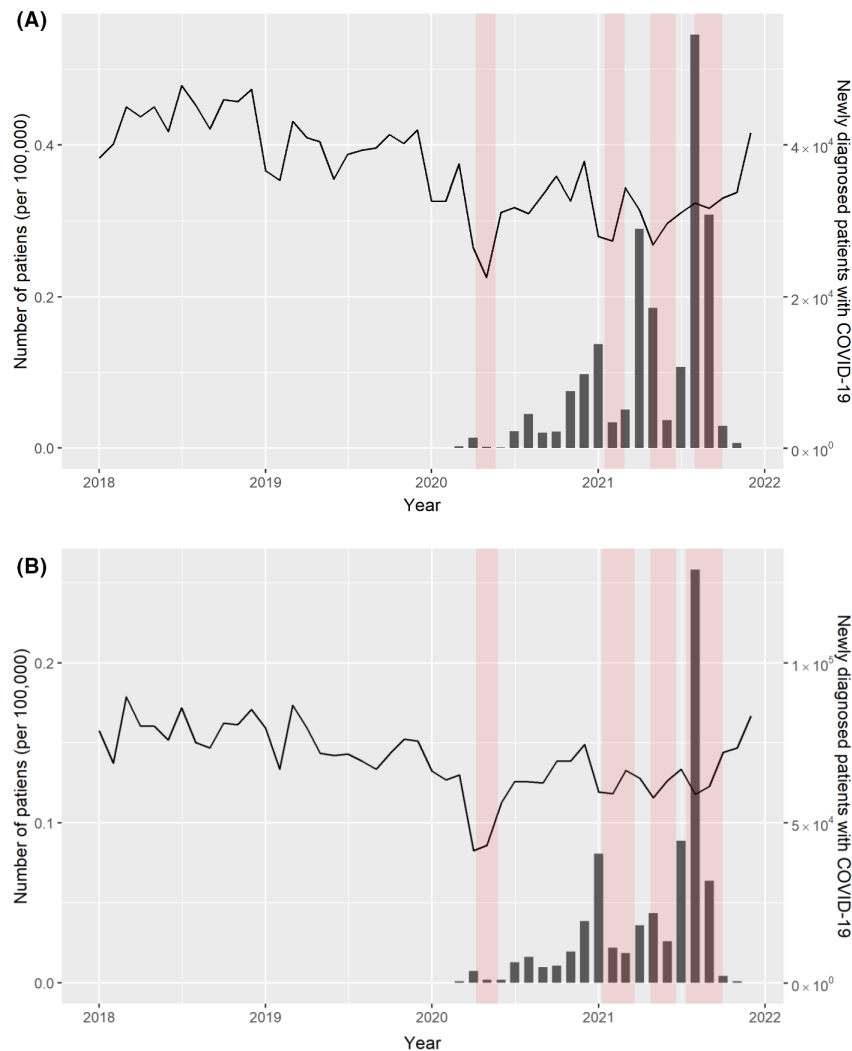
(0.08 [0.07–0.09] versus 0.08 [0.06–0.11];  $P = 0.65$ ) and Osaka (0.10 [0.09–0.11] versus 0.14 [0.10–0.16];  $P = 0.08$ ) (Fig. 2). Mortality during the state of emergency was not significantly lower than that during other periods in Tokyo (0.46% versus 0.50%;  $P = 0.52$ ) and Osaka (0.45% versus 0.44%;  $P = 0.94$ ).

The number of trauma patients was the lowest at the beginning of the emergency period, which tended to increase during the emergency period (Fig. 3). In Tokyo, reduction rates of traffic trauma patients due to the state of emergency during 2018, 2019, 2020, and 2021 were 36%, 21%, 13%, and 12%, respectively; the corresponding reduction rates in Osaka were 40%, 28%, 22%, and 2%, respectively. In both cities, reduction rates were highest during the first declaration of the state of emergency and decreased with each subsequent declaration.

## DISCUSSION

THERE WERE SIGNIFICANTLY fewer trauma patients due to traffic accidents during the state of emergency than during the other periods in Tokyo and Osaka. A decrease in the number of patients was also observed before the state of emergency, which tended to increase during the emergency period. However, reduction rates decreased as the period passed.

The number of patients from traffic accidents was significantly lower during the pandemic period and periods of the state of emergency than during the non-pandemic and other periods in Tokyo and Osaka. These findings can be explained by the social distancing policies. There are three main motives for cooperation for infection control: (i) to prevent the spread of COVID-19, (ii) to avoid infecting others,



**Fig. 3.** Trends in the number of patients due to traffic accidents and newly diagnosed patients with COVID-19 in (A) Tokyo and (B) Osaka. The line represents the number of patients due to traffic accidents per month, and the bar represents the average number of newly diagnosed patients with COVID-19 per day. The red area represents the duration of the emergency state. COVID-19, coronavirus disease 2019.

and (iii) to respect social norms. As most individuals in Japan respected these motives, the disease was controlled without imposing strong regulations, as in other countries.<sup>10</sup> Moreover, a state of emergency restricted visits to restaurants and other events, which resulted in an additional decrease in the number of trauma patients. The number of motor vehicle accidents in Ohio changed the most during the state of emergency, with a decrease of  $-5.08\%$  (95% confidence interval,  $-6.48\%$  to  $-3.65\%$ ), which was the lowest at the beginning of the stay-at-home order.<sup>11</sup> Although the number of patients from traffic accidents dropped rapidly and was the lowest at the beginning of the state of emergency, reduction rates decreased as the period

passed. It is possible that the motivation for infection control decreased due to the increase in vaccination rates and the stress caused by self-restraint.

During the pandemic period and the state of emergency, fewer patients were involved in traffic accidents, with no significant difference in the number of deaths. Previous studies reported that the number of deaths remained the same or increased<sup>5,12–14</sup>; potential reasons include increases in speed for congestion relief, more drivers under the influence of alcohol or drugs, and delayed surgery due to the pandemic.<sup>7,14–18</sup> The reasons for the lack of reduction in the number of deaths and compensation for the effect of the reduced number of injuries are not clear. In urban areas, the

number of deaths did not tend to decrease. The national average number of deaths decreased to 18.6% during the pandemic, whereas Tokyo and Osaka reported a 2.7% increase and a 4.8% decrease in death rates, ranking 45th and 39th, respectively, among the 47 prefectures.<sup>9</sup> Tokyo, Kanagawa, and Osaka, which account for 25% of Japan's population, are the three prefectures with the largest population densities and rank in the top 10 with the lowest reduction rates in deaths. There are no data available regarding the number of deaths, vehicle type, and pedestrians by region, although this finding can be attributed to the differences in urban and rural lifestyles. Half of the fatalities due to traffic accidents in Tokyo and Osaka were caused by the elderly, and most accidents involving pedestrians and bicyclists occurred near their homes. Therefore, it is possible that the COVID-19 pandemic did not reduce the number of deaths, as several accidents originally occurred during necessary outings. However, the number of accidents involving pedestrians and bicyclists decreased, and the number of accidents caused by drivers increased in New York City.<sup>13</sup> A more detailed analysis of traffic accidents is required to implement strategies for reducing the number of deaths.

This study has several limitations. Months with declarations of emergency for at least 21 days were defined as the months of the state of emergency. There is a slight discrepancy between the actual duration of the state of emergency and the set period. However, the declaration of a state of emergency was not instantaneous; there was a time lag between the increase in the number of patients with COVID-19, decision to issue a state of emergency, and declaration of a state of emergency. Therefore, the state of emergency was not the only factor that affected the number of patients with trauma caused by traffic accidents, which was a gradual process. Even before the state of emergency began, there were already visible effects. Therefore, the impact of this discrepancy would be small. Furthermore, because the number of patients due to traffic accidents is counted by month, the number of days and holidays may vary, and unintended changes might have been presented. Second, the number of deaths from traffic accidents has been gradually decreasing year on year. However, the effect of this downward trend was not considered. Even allowing for this effect, the number of patients would still be decreasing.<sup>3,19</sup> Moreover, because a state of emergency was declared four times over a certain period of time (not consecutively), its effects can be ignored.

## CONCLUSION

THERE WERE SIGNIFICANTLY fewer trauma patients due to traffic accidents during the periods of state of

emergency than during other periods, with no significant difference in the number of deaths. A decrease in the number of patients was observed before the emergency period; however, the reduction rate decreased as the period passed.

## DISCLOSURE

**A**PPROVAL OF THE Research Protocol: Ethical approval was not required for secondary analysis of publicly available data.

Informed Consent: Not applicable.

Registry and the Registration No. of the study/Trial: Not applicable.

Animal Studies: Not applicable.

Conflict of Interest: Authors declare no conflict of interests for this article.

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