Original Article

Impact of the COVID-19 pandemic and subsequent social restrictions on ambulance calls for suicidal and nonsuicidal self-harm: a population-based study in Osaka prefecture, Japan

Shunichiro Nakao,[1] Yusuke Katayama,[1] Kenta Tanaka,[2] Tetsuhisa Kitamura,[2] Tomoya Hirose,[1] Jotaro Tachino,[1] Taku Iwami,[3] Takeshi Shimazu,[4] Jun Oda,[1] and Tetsuya Matsuoka[5]

[1]Department of Traumatology and Acute Critical Medicine, Osaka University Graduate School of Medicine, Osaka, Japan, [2]Division of Environmental Medicine and Population Sciences, Department of Social and Environmental Medicine, Osaka University Graduate School of Medicine, Osaka, Japan, [3]Department of Preventive Services, School of Public Health, Kyoto University, Kyoto, Japan, [4]Osaka General Medical Center, Osaka, Japan, and [5]Rinku General Medical Center, Osaka, Japan

Aim: Self-harm is a common ambulance call and is potentially affected by the COVID-19 pandemic. The aim of this study was to investigate whether the incidence of ambulance transport due to self-harm increased in 2020.

Methods: We undertook a population-based observational study using a database from the Osaka prefectural government. Ambulance transport of patients due to self-harm from 2016 through 2020 was investigated. We estimated adjusted incidence rate ratios using a Poisson regression model to compare the annual incidence rates of ambulance transport in 2017–2020 with those in 2016. We also provided age-stratified analysis.

Results: We analyzed 13,648 patients. There was no difference in the incidence of ambulance transport due to self-harm in 2017, 2018, 2019, and 2020 compared with 2016. In the age group of 20–29 years, despite no difference in 2017–2019 compared with 2016, we found a 13.8% increase in the incidence of ambulance transport due to self-harm in 2020 (adjusted incidence rate ratio, 1.138; 95% confidence interval, 1.025–1.265).

Conclusions: Although there was no difference in the incidence of ambulance transport due to self-harm in 2017–2019, that in 2020 increased in the age group of 20–29 years.

Key words: Ambulance transport, COVID-19 pandemic, mental health, population-based research, self-harm

INTRODUCTION

THE CORONAVIRUS DISEASE 2019 (COVID-19) pandemic was declared by the World Health Organization in March 2020 and has become a global public health emergency.[1,2] Many countries implemented a variety of nonpharmaceutical interventions (NPIs) to control the pandemic, including lockdowns, travel restrictions, and social distancing.[3,4] A previous systematic review supported physical distancing and wearing of face masks to reduce the risk of infection.[5] Although it is necessary to control the person-to-person transmission of and reduce the morbidity and mortality caused by COVID-19, restrictions on the activities of people by these infection control measures can affect their mental health as opportunities for social and physical interaction with others are important for maintaining mental health. Furthermore, economic activity would have to be restrained, unemployment would increase, and life would become more difficult. Unemployment and

†Working Group to Analyze the Emergency Medical Care System in Osaka Prefecture.

Corresponding: Shunichiro Nakao, MSc, MD, PhD, Department of Traumatology and Acute Critical Medicine, Osaka University Graduate School of Medicine, 2-15 Yamadaoka, Suita, Osaka 565-0871, Japan. E-mail: shunichironakao@hp-emerg.med.osaka-u.ac.jp.

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increased economic burdens can significantly affect mental health problems.[6] In the COVID-19 pandemic, there is an urgent need for research on mental health problems and to find ways to mitigate their consequences.[7]

Self-harm is a common reason for an ambulance call and a significant public health concern. Some reports describe decreased hospital presentation for self-harm after the introduction of lockdown in England and decreased mental health presentations to emergency departments as the number of COVID-19 patients increased in Western Australia.[8,9] However, there are several reports worldwide that suggest an increase in the incidence of self-harm during the COVID-19 pandemic.[10–14] The COVID-19 pandemic has imposed a tremendous burden on the emergency medical services (EMS) in Japan.[15] Because the number of COVID-19 patients rapidly increased in April 2020, the Japanese government declared a state of emergency that applied to prefectures with surging numbers of infections, including Tokyo and Osaka. Japanese municipal governments had also implemented NPIs, such as the temporary closure of schools, promoting telework, refraining from going out, cancelling large-scale events, and requesting restaurants and bars to temporarily close.

The COVID-19 pandemic and these behavioral restrictions have potentially had some impact on ambulance calls related to suicidal and nonsuicidal self-harm in Japan. However, there is still insufficient information available on the impact of the COVID-19 pandemic on ambulance calls due to mental health problems. The aim of this study was to investigate whether the incidence of patients with suicidal and nonsuicidal self-harm who were brought to the emergency departments by ambulance increased in 2020 compared to previous years. The age-stratified incidence rates were also calculated to identify the vulnerable age groups.

METHODS

Study design, setting, and data sources

WE UNDERTOOK A population-based observational study using the database from the ORION (Osaka emergency information Research Intelligent Operation Network) system, which is a comprehensive area-based database operated by the Osaka prefectural government. The ORION includes the following information on patients transported by fire departments in Osaka prefecture: ambulance calls, ambulance transport records, Utstein template for cardiopulmonary arrest, hospital selection and transport criteria, and hospital information on main diagnoses and treatment. The database covers the entire area of Osaka prefecture (population, 8.82 million; area, 1899 km^2), and the system has been in operation since January 2013, with hospital data also being collected since January 2015.[16] The ORION database included information on ambulance transport records, which were collected for administrative purposes with a standardized electronic form.[17] The data were completed by EMS personnel and then transferred to the information center at the local fire department. If the data were incomplete, they were returned to the relevant EMS personnel for completion. The health-care system in Japan has been based on universal health coverage since 1961,[18] and the ambulance service in Japan is a public service completely free of charge.

The medical institutional review board of Osaka University Graduate School of Medicine approved this study and waived the need for informed consent because all analyses used anonymous data (approval no. 15003).

Population

We included all emergency patients in the ORION database with a record of self-harm as the reason for transport during 2016 through 2020. "Self-harm" was one of the selectable reasons for transport by EMS personnel and was defined as any act of self-poisoning or self-injury regardless of suicidal ideation.[19] This decision was made by EMS personnel based on on-site observations and an EMS interview with the patient.[20] We excluded patients who were transported within 21 days between hospitals as their survival data were unknown, those with missing survival data, and those who left hospital without being seen by a physician.

Variables

Data were collected using standardized data collection forms and included age, sex, location of the event (private residence, public place, road, workspace, and others), time of the event (time of day, day of week, and month of year), main diagnosis at the emergency department to identify methods of self-harm, disposition on arrival day, 21-day outcomes after admission, and 21-day in-hospital mortality. We categorized age into eight groups: 19 years and younger, 20–29 years, 30–39 years, 40–49 years, 50–59 years, 60–69 years, 70–79 years, and 80 years and older. Time of day was categorized into four periods: 0:00 to 5:59, 6:00 to 11:59, 12:00 to 17:59, and 18:00 to 23:59. Day of the week was categorized as weekday (Monday to Friday) or weekend (Saturday or Sunday). We categorized the method of self-harm as the following groups based on the main diagnosis at the emergency department: self-poisoning, trauma, hanging/asphyxiation, burn, and unknown. In case the main diagnosis did not reflect the method of self-harm (e.g., pneumonitis

due to solids and liquids), it was categorized as unknown. Disposition on arrival day and 21-day outcome after admission were both categorized as admission, discharge, and death.

Statistical analysis

Continuous variables are presented as the median and interquartile range and categorical variables as counts and percentages. Incidence rates of ambulance transport due to self-harm per 100,000 person-years were calculated using annual population reports from Osaka prefecture.[21]

To compare the incidence rates of ambulance transport due to self-harm and all-cause in-hospital mortality within 21 days in 2017 through 2020 with those in 2016, we estimated unadjusted and adjusted incidence rate ratios (IRRs) with 95% confidence intervals (CIs) using a Poisson regression model with a log (population) offset term for population of Osaka prefecture in 2019. The covariates included in adjusted analyses were age groups, sex, and month of year. We calculated age-stratified IRRs for ambulance transport due to self-harm to identify the vulnerable age groups. We also estimated IRRs stratified by sex. In addition, we calculated IRRs comparing between remaining pairs of years.

All tests were two-tailed, and *P* values of less than 0.05 were considered to indicate statistical significance. All statistical analyses were undertaken with R Statistical Software (version 3.6.2; R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Study patients

FIGURE 1 shows the patient flow of the study. During the study period, 2,333,651 ambulance transports were recorded in the ORION database and 14,827 emergency patients were transported due to self-harm. Among them, 13,648 patients were eligible for this study. There were 2,760 patients in 2016, 2,753 patients in 2017, 2,592 patients in 2018, 2,720 patients in 2019, and 2,841 patients in 2020. The incidence rate of ambulance transport was 30.9 cases per 100,000 person-years in the total population; the incidence rates in each year were 31.3, 31.2, 29.4, 30.7, and 32.1 in 2016, 2017, 2018, and 2019, respectively. Patient characteristics and their yearly trends are summarized in Table 1. The median age of the overall patient population was 40 years (interquartile range, 26–53 years). The largest age group was 20–29 years (23.7%), followed by 40–49 years (19.5%). Female patients (68.1%) were more than twice as frequent as male patients (31.9%). Most of the self-harm patients were transported from private residences (82.7%). The most common time of day was 18:00 to 23:59 (31.6%), followed by 12:00 to 17:59 (24.9%). The most common month of the year was September (9.4%), followed by July (9.2%). The most frequent method of self-harm was self-poisoning (44.2%). Overall, 21-day in-hospital mortality was 15.7%, and 21-day in-hospital mortality in each year was 15.1%, 15.5%, 16.7%, 14.7%, and 16.6% in 2016, 2017, 2018, 2019, and 2020, respectively.

Analyses of IRR for self-harm and mortality

Table 2 shows the results of analyses for incidence rates of ambulance transport due to self-harm. Compared with the numbers of ambulance transports due to self-harm in 2016, there was no statistically significant difference in the incidence of ambulance transport due to self-harm in 2017 (adjusted IRR, 1.010; 95% CI, 0.958–1.065; $P = 0.712$), 2018 (adjusted IRR, 0.983; 95% CI, 0.931–1.037; $P = 0.525$), 2019 (adjusted IRR, 0.992; 95% CI, 0.941–1.046; $P = 0.766$), or 2020 (adjusted IRR, 1.030; 95% CI, 0.978–1.086; $P = 0.268$). Table 3 shows the results of analyses for 21-day in-hospital mortality. Compared with the 21-day in-hospital mortality in 2016, there was no statistically significant difference in that in 2017 (adjusted IRR, 0.982; 95% CI, 0.958–1.065; $P = 0.712$), 2018 (adjusted IRR, 0.995; 95% CI, 0.931–1.037; $P = 0.525$), 2019 (adjusted IRR, 0.973; 95% CI, 0.941–1.046; P = 0.766), or 2020 (adjusted IRR, 0.976; 95% CI, 0.978–1.086; $P = 0.268$). Comparisons between remaining pairs of years showed no statistically significant difference (Table S4).

Incidence rate ratios by age group

Table 4 describes the results of analyses for age-stratified incidence rates of ambulance transport due to self-harm. In the age group of 20–29 years, compared with the incidence of ambulance transport due to self-harm in 2016, there was no statistically significant difference in the incidence in 2017 (adjusted IRR, 0.993; 95% CI, 0.889–1.109; $P = 0.899$), 2018 (adjusted IRR, 1.012; 95% CI, 0.905–1.131; $P = 0.836$), or 2019 (adjusted IRR, 1.031; 95% CI, 0.924–1.150; $P = 0.590$). However, there was a 13.8% increase in the incidence of ambulance transport due to self-harm in 2020 (adjusted IRR, 1.138; 95% CI, 1.025–1.265; $P = 0.016$), which was statistically significant (Table 4). In the age group of 40–49 years, there was also a statistically significant increase in the incidence of ambulance transport due to self-harm in 2017 (adjusted IRR, 1.128; 95% CI, 1.006–1.265; $P = 0.040$), but the difference was not statistically significant in other years. We did not observe any

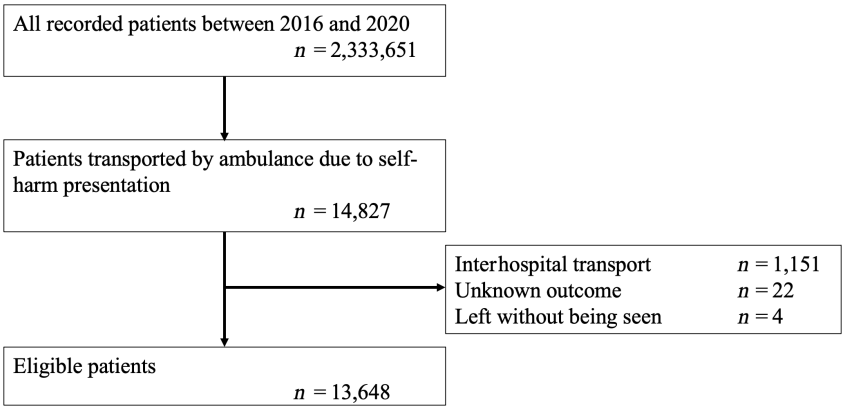

Fig. 1. Patient flow.

statistically significant difference in incidence rates among the other age groups.

In the analyses stratified by sex, we did not observe any difference in the incidence of ambulance transport due to self-harm (see Table S1, which shows overall in-hospital mortality rate ratios for all-cause in-hospital mortality within 21 days from 2016 through 2020 by sex). In the analyses stratified by age and sex, although there was no difference in any age group in male patients, the incidence of ambulance transport due to self-harm in female patients increased statistically significantly in the age group of 20–29 in 2020 (adjusted IRR, 1.170; 95% CI, 1.037–1.320; P = 0.011) and in the age group of 40–49 years in 2017 (adjusted IRR, 1.203; 95% CI, 1.047–1.383; P = 0.009), but it decreased in the age group of 30–39 years in 2018 (adjusted IRR, 0.865; 95% CI, 0.749–0.998; P = 0.047) compared with the incidence of ambulance transport due to self-harm in 2016 (see Tables S2 and S3, which show incidence rate ratios of patients with self-harm from 2016 through 2020 by age group in male and female patients). Comparisons between remaining pairs of years showed the same trends with these results (Table S5).

DISCUSSION

WE REPORTED THE comprehensive analysis of the characteristics of patients with ambulance transport due to self-harm and investigated the incidence rates from 2016 through 2020 using a population-based database. We did not observe a statistically significant difference in the incidence rates of ambulance transport due to self-harm and 21-day in-hospital mortality in these patients in 2017 through 2020 compared to those in 2016. However, in the age group of 20–29 years, the adjusted IRR of the incidence rate of ambulance transport due to self-harm was significantly greater in 2020 than in 2016. The subgroup analysis by sex showed the same trend in female patients but not in male patients.

In 2020, the COVID-19 pandemic and the related government responses could have affected mental health in the young population. A systematic review of surveys undertaken with the general public reported that the COVID-19 pandemic caused anxiety, depression, and psychological stress.[22] Fake news on social media and wrong information disseminated on mass media are a growing problem, and especially young people might be negatively affected.[23] The increased strain on childcare due to temporary closure of schools, refraining from going out, and cancelling of large-scale events could also affect young adults. Our study suggested that the age group of 20–29 years could be more vulnerable to mental health problems brought about by the COVID-19 pandemic and the related environmental changes than other age groups.

Although the reason for the increase in ambulance transport due to self-harm in the age group of 20–29 years in 2020 remains unclear, our study showed this age group to be the largest of all the age groups and suggested that urgent interventions in mental health-care for the young population are required as NPIs and behavioral restrictions still appear to be necessary to control the COVID-19 pandemic in Japan. Promoting timely access to mental health-care and enhancing financial and social support could contribute to decrease the incidence of self-harm.[24] Moreover, a previous study argued that many acute care hospitals in Japan were not able to provide appropriate psychiatric care for patients who engaged in self-harm.[25] Initiating psychiatric care intervention in the emergency hospitals receiving these patients could help to improve patient care for those who visit the emergency department due to self-harm. Aside from infection control, modifying access to the diagnosis and treatment

Table 1. Characteristics of patients transported by ambulance due to self-harm from 2016 through 2020, Osaka prefecture

Characteristic	Total		2016		2017		2018		2019		2020	
	n = 13,648		*n* = 2,760		*n* = 2,753		*n* = 2,592		*n* = 2,707		*n* = 2,836	
Incidence rate, cases per 100,000 person-years	30.9		31.3		31.2		29.4		30.7		32.1	
Age, years; median, Q1–Q3	40	26–53	40	28–53	41	28–52	40	26–54	39	26–53	38	25–53
Age group, years; *n* (%)												
≤19	1,046	7.7	164	5.9	174	6.3	212	8.2	244	9.0	252	8.9
20–29	3,231	23.7	654	23.7	608	22.1	590	22.8	636	23.5	743	26.2
30–39	2,511	18.4	554	20.1	493	17.9	480	18.5	501	18.5	483	17.0
40–49	2,665	19.5	545	19.7	635	23.1	487	18.8	514	19.0	484	17.1
50–59	1,758	12.9	323	11.7	361	13.1	335	12.9	362	13.4	377	13.3
60–69	970	7.1	230	8.3	207	7.5	186	7.2	168	6.2	179	6.3
70–79	897	6.6	181	6.6	174	6.3	185	7.1	167	6.2	190	6.7
≥80	570	4.2	109	3.9	101	3.7	117	4.5	115	4.2	128	4.5
Sex, *n* (%)												
Male	4,351	31.9	907	32.9	920	33.4	843	32.5	834	30.8	847	29.9
Female	9,297	68.1	1,853	67.1	1,833	66.6	1,749	67.5	1,873	69.2	1,989	70.1
Location, *n* (%)												
Private residence	11,290	82.7	2,287	82.9	2,283	82.9	2,152	83.0	2,215	81.8	2,353	83.0
Public place	1,111	8.1	219	7.9	210	7.6	202	7.8	246	9.1	234	8.3
Road	613	4.5	130	4.7	129	4.7	117	4.5	126	4.7	111	3.9
Workplace	116	0.8	24	0.9	24	0.9	19	0.7	26	1.0	23	0.8
Other	518	3.8	100	3.6	107	3.9	102	3.9	94	3.5	115	4.1
Time of day, *n* (%)												
0:00–5:59	3,176	23.3	646	23.4	636	23.1	603	23.3	621	22.9	670	23.6
6:00–11:59	2,758	20.2	542	19.6	590	21.4	552	21.3	502	18.5	572	20.2
12:00–17:59	3,404	24.9	724	26.2	660	24.0	631	24.3	696	25.7	693	24.4
18:00–23:59	4,310	31.6	848	30.7	867	31.5	806	31.1	888	32.8	901	31.8
Day of week, *n* (%)												
Weekday	9,927	72.7	2,027	73.4	1,989	72.2	1,885	72.7	1,964	72.6	2,062	72.7
Weekend	3,721	27.3	733	26.6	764	27.8	707	27.3	743	27.4	774	27.3
Month, *n* (%)												
Jan	1,082	7.9	222	8.0	234	8.5	208	8.0	172	6.4	246	8.7
Feb	978	7.2	217	7.9	218	7.9	169	6.5	182	6.7	192	6.8
Mar	1,101	8.1	225	8.2	210	7.6	204	7.9	232	8.6	230	8.1
Apr	1,064	7.8	233	8.4	248	9.0	206	7.9	202	7.5	175	6.2
May	1,184	8.7	233	8.4	263	9.6	219	8.4	237	8.8	232	8.2
Jun	1,216	8.9	249	9.0	235	8.5	218	8.4	261	9.6	253	8.9
Jul	1,256	9.2	218	7.9	250	9.1	241	9.3	259	9.6	288	10.2
Aug	1,209	8.9	237	8.6	248	9.0	238	9.2	242	8.9	244	8.6
Sep	1,280	9.4	263	9.5	243	8.8	250	9.6	233	8.6	291	10.3
Oct	1,196	8.8	233	8.4	223	8.1	229	8.8	236	8.7	275	9.7
Nov	1,068	7.8	246	8.9	196	7.1	215	8.3	224	8.3	187	6.6
Dec	1,014	7.4	184	6.7	185	6.7	195	7.5	227	8.4	223	7.9
Method of self-harm												
Self-poisoning	6,027	44.2	1,092	39.6	1,143	41.5	1,188	45.8	1,237	45.7	1,367	48.2
Self-injury	3,869	28.3	782	28.3	789	28.7	713	27.5	820	30.3	765	27.0
Hanging/asphyxiation	349	2.6	64	2.3	60	21.8	63	2.4	96	3.5	66	2.3
Burn	23	0.2	3	0.1	5	0.2	5	0.2	5	0.2	5	0.2
Unknown	3,380	24.8	819	29.7	756	27.5	623	24.0	549	20.3	633	22.3

Table 1. (Continued)

Characteristic	Total		2016		2017		2018		2019		2020	
	n = 13,648		*n* = 2,760		*n* = 2,753		*n* = 2,592		*n* = 2,707		*n* = 2,836	
Disposition on arrival day, *n* (%)												
Admission	5,934	43.5	1,119	40.5	1,195	43.4	1,201	46.3	1,199	44.3	1,220	43.0
Discharge	6,263	45.9	1,347	48.8	1,277	46.4	1,115	43.0	1,234	45.6	1,290	45.5
Death	1,451	10.6	294	10.7	281	10.2	276	10.6	274	10.1	326	11.5
21-day outcome after admission, *n* (%)	(*n* = 5,934)		(*n* = 1,119)		(*n* = 1,195)		(*n* = 1,201)		(*n* = 1,199)		(*n* = 1,220)	
Admission	550	9.3	126	11.3	110	9.2	108	9.0	103	8.6	103	8.4
Discharge	4,686	79.0	869	77.7	939	78.6	936	77.9	969	80.8	973	79.8
Death	698	11.8	124	11.1	146	12.2	157	13.1	127	10.6	144	11.8
21-day in-hospital mortality, *n* (%)	2,149	15.7	418	15.1	427	15.5	433	16.7	401	14.7	470	16.6

Table 2. Incidence rate ratios (IRR) of patients transported by ambulance due to self-harm, Osaka prefecture, by year

Years	Unadjusted IRR	95% CI	*P* value	Adjusted IRR	95% CI	*P*-value
2017 versus 2016	1.000	0.949–1.054	0.994	1.010	0.958–1.065	0.712
2018 versus 2016	0.942	0.893–0.994	0.028	0.983	0.931–1.037	0.525
2019 versus 2016	0.983	0.933–1.037	0.538	0.992	0.941–1.046	0.766
2020 versus 2016	1.028	0.975–1.083	0.310	1.030	0.978–1.086	0.268

Multivariate models were adjusted for age group, sex, and month.
Abbreviation: CI, confidence interval.

Table 3. Overall mortality rate ratio for all-cause mortality within 21 days among patients transported by ambulance due to self-harm, Osaka prefecture, 2016–2020

Years	Unadjusted IRR	95% CI	*P*-value	Adjusted IRR	95% CI	*P*-value
2017 versus 2016	0.972	0.849–1.112	0.677	0.982	0.858–1.125	0.795
2018 versus 2016	0.999	0.873–1.142	0.984	0.995	0.869–1.139	0.941
2019 versus 2016	0.978	0.853–1.121	0.748	0.973	0.847–1.116	0.691
2020 versus 2016	0.995	0.872–1.135	0.936	0.976	0.854–1.114	0.716

Multivariate models were adjusted for age group, sex, and month.
Abbreviations: CI, confidence interval; IRR, incidence rate ratio.

of COVID-19, ensuring continuity of care for mental health service users, and paying attention to new patients with mental health problems could also address the mental health concerns in the public.[26]

We also observed increases in the overall incidence of self-harm in the age group of 40–49 years in 2017 and in the incidence of self-harm among female patients in this age group in 2017, along with a decrease in the incidence of self-harm in the age group of 30–39 years in 2018. Although the exact reason for these findings is unclear, it might be explained by the results of a previous study that showed an association between self-harm in midlife and financial problems.[27] The number of corporate bankruptcies in Osaka prefecture peaked in 2017, which can cause

Table 4. Incidence rate ratios of patients transported by ambulance due to self-harm, Osaka prefecture, 2016–2020, by age group

Age group, years	Frequency	Adjusted IRR	95% CI	*P*-value
≤19				
2017 versus 2016	174 versus 164	0.965	0.779–1.195	0.741
2018 versus 2016	212 versus 164	1.019	0.831–1.252	0.855
2019 versus 2016	244 versus 164	1.104	0.906–1.349	0.329
2020 versus 2016	252 versus 164	1.095	0.899–1.336	0.370
20–29				
2017 versus 2016	608 versus 654	0.993	0.889–1.109	0.899
2018 versus 2016	590 versus 654	1.012	0.905–1.131	0.836
2019 versus 2016	636 versus 654	1.031	0.924–1.150	0.590
2020 versus 2016	743 versus 654	1.138	1.025–1.265	0.016
30–39				
2017 versus 2016	493 versus 554	0.932	0.825–1.052	0.253
2018 versus 2016	480 versus 554	0.894	0.791–1.010	0.072
2019 versus 2016	501 versus 554	0.914	0.810–1.031	0.145
2020 versus 2016	483 versus 554	0.959	0.848–1.083	0.499
40–49				
2017 versus 2016	635 versus 545	1.128	1.006–1.265	0.040
2018 versus 2016	487 versus 545	0.994	0.879–1.123	0.924
2019 versus 2016	514 versus 545	0.962	0.852–1.085	0.528
2020 versus 2016	484 versus 545	0.971	0.859–1.097	0.635
50–59				
2017 versus 2016	361 versus 323	0.996	0.857–1.158	0.955
2018 versus 2016	335 versus 323	0.944	0.810–1.100	0.458
2019 versus 2016	362 versus 323	0.998	0.859–1.160	0.980
2020 versus 2016	377 versus 323	1.033	0.891–1.200	0.666
60–69				
2017 versus 2016	207 versus 230	0.989	0.819–1.194	0.911
2018 versus 2016	186 versus 230	1.031	0.848–1.251	0.759
2019 versus 2016	168 versus 230	1.013	0.829–1.235	0.900
2020 versus 2016	179 versus 230	0.988	0.812–1.201	0.905
70–79				
2017 versus 2016	174 versus 181	0.990	0.803–1.220	0.925
2018 versus 2016	185 versus 181	1.008	0.821–1.238	0.939
2019 versus 2016	167 versus 181	0.983	0.795–1.214	0.872
2020 versus 2016	190 versus 181	1.029	0.838–1.264	0.783
≥80				
2017 versus 2016	101 versus 109	1.048	0.797–1.377	0.737
2018 versus 2016	117 versus 109	1.072	0.823–1.396	0.606
2019 versus 2016	115 versus 109	1.017	0.779–1.329	0.900
2020 versus 2016	128 versus 109	0.996	0.770–1.290	0.973

Multivariate models were adjusted for sex and month.
Abbreviations: CI, confidence interval; IRR, incidence rate ratio.

financial difficulties in midlife, and was the lowest in 2018 during the study period, indicating that life for people of working age was more stable than in other years.[28] This finding implies the importance of the ORION database as a population-based registry in emergency medicine.

Our study has several potential limitations. First, our database did not include information about the motivation for self-harm, such as suicidal intention. Therefore, we could not separately assess nonsuicidal self-harm and suicidal self-harm. Second, the reason for the transport of patients with

severe trauma due to a fall from height could be misclassified as accidental injury if there was no evidence of self-harm at the scene. Because the selection of self-harm patients was based on on-site observations and an EMS interview within a limited period of time, misclassification is inevitable. Although incomplete data collection forms were returned to the relevant EMS personnel for completion, there was no extra process to validate it was truly "self-harm." These could result in underestimation of the incidence of self-harm. Third, the information on the method of self-harm was limited and many of them remained unknown because the main diagnoses included in the ORION database were not always related with self-harm. Fourth, the results of the present study did not consider the frequency and intensity of self-harm. Finally, this study used a database that included patients only in Osaka prefecture. Therefore, our inferences might not be generalizable to other areas with different cultural backgrounds, medical systems, and policies. Despite these limitations, the results of the present population-based study are essential as the availability of epidemiological information to improve mental health-care is highly relevant from a policy standpoint.

CONCLUSIONS

FROM THE COMPREHENSIVE analysis of the characteristics of patients transported by ambulance due to self-harm from 2016 through 2020 using the ORION population-based database in Osaka prefecture, we did not observe a statistically significant difference in the incidence rates of ambulance transport due to self-harm and 21-day in-hospital mortality. However, we found the age group of 20–29 years to be the largest age group, and the adjusted IRRs suggested that the incidence rate of ambulance transport due to self-harm in this age group increased in 2020.

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DISCLOSURE

APPROVAL OF THE research protocol: The medical institutional review board of Osaka University Graduate School of Medicine approved this study and waived the need for informed consent because all analyses used anonymous data (approval no. 15003).

Informed consent: The requirement for informed consent of patients was waived.

Registry and registration no. of the study/trial: N/A.

Animal studies: N/A.

Conflict of interest: None.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Overall mortality rate ratios for all-cause mortality within 21 days, 2016 through 2020, by sex.

Table S2. Incidence rate ratios of male patients with self-harm, 2016–2020, by age group.

Table S3. Incidence rate ratios of female patients with self-harm, 2016–2020, by age groups.

Table S4. Multiple comparisons in incidence rate ratios of patients with self-harm by year.

Table S5. Multiple comparisons in incidence rate ratios of patients with self-harm by age group.