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Original Article

Factors Affecting the Choice of Suicide Method in Okayama: A Database Analysis from a Forensic Perspective

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The annual number of suicides in Japan increased sharply in 1998, and since that time it has consistently exceeded 30,000 per year. In this study, we analyze a database of personal and background characteristics of 824 cases (605 men, 219 women) who completed suicide in Okayama Prefecture in 2002 and 2003. The data were obtained with cooperation from the police. Using the methodologies in a previous European study as a model, we classified the suicide methods into 8 categories. To examine the generational and regional differences in the choice of methods, we stratified the sample into 4 age groups (≤24, 25～44, 45～64, and ≥65) and 2 regional groups (Okayama/Kurashiki vs. other areas). Our results on gender differences in 7 of the suicide methods were mostly similar to the European data. However, our data showed a remarkably higher proportionate male-to-female mortality ratio for poisoning by other substances (ICD–10, X65–X69 codes) (1.83, 1.15–2.92). In terms of generational differences in the choice of suicide methods, the Mantel-Haenszel test of homogeneity was significant for most of the categories in our study, suggesting an impact of age on how people commit suicide. There were no remarkable regional differences in our sample. An epidemic curve for suicides via carbon monoxide poisoning using charcoal briquets revealed a trend of time clustering not observed in the other 6 means. The database constructed and used in this study contains richer information than conventional death statistics and is expected to provide helpful knowledge and insights for future epidemiological studies.

Key words: suicide methods, gender-specific, legal medicine, cluster suicide

Identification of effective suicide prevention measures is an issue of critical concern for public health professionals worldwide. In Japan, the annual number of suicides increased sharply by 8,000 in 1998 and has since stayed at a high rate, continuously exceeding the 30,000 mark [1]. Middle-aged and older men account for the majority of the sharp increase. In terms of age-adjusted death rates (per 100,000 population) in Japan, suicides among men grew sharply to 37.3 in 1998 from 26.9 in the previous year, whereas the rate among women increased only slightly, from 11.1 to 13.7. The crude death rate for suicides in men grew even further to reach 38.5 per 100,000 population in 2003, the all-time highest [2].

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Suicide prevention measures, therefore, are important public health concerns faced by Japan. Research investigating the relationship between methods of suicide and personal characteristics and background factors, including culture, race, gender, and age, provides helpful insights for the development of effective prevention measures and intervention programs [3].

A literature review on the effectiveness of various suicide prevention and intervention methods reveals only 2 evidence-based approaches: educating general physicians to increase their understanding of depression and its treatment, and banning/limiting the access to suicidal methods with high lethality [4].

In Japan, prevention methods based on the depression model have produced consistent improvements in the consultation rate and in the public's understanding of suicide [1]. However, since the effect among groups of suicide attempters was found to be limited, the total number of suicides was not in fact decreased. On the other hand, it is not easy to determine specific objectives for decreasing the suicide rate based on a strategy of banning or limiting the access to highly lethal methods, since access to and possession of guns are prohibited by law and regulations pertaining to medical drugs and chemical substances are strict in Japan. Within the context of these limitations, we must seek effective strategies for decreasing the number of suicide cases.

In terms of gender differences, suicide rates in Japan are 2–3 times higher among men than women, which is similar to the findings in Europe and the U.S. [5]. Several studies report that the gender disparity in suicide completion rates is best explained by the differences in the choice of methods between men and women [6–9].

A large-scale comparative study on the choice of suicide methods and its gender differences [10] classified suicide methods into 7 categories based on the International Classification of Diseases and Related Health Problems, 10th Revision (ICD-10, World Health Organization: WHO, 1990) codes. It employed the proportionate male-to-female mortality ratio (PMR) as an index to examine gender differences in suicide methods in a database of 16 countries participating in the European Alliance Against Depression (EAAD). Results from this study, which was based on data of 160,460 suicides that occurred in the participating countries of the EAAD during the years 2000 to 2004 (and part of 2005), substantiated previous research findings on gender differences in the choice of methods.

In 2006, the Japanese government enforced the basic law on suicide prevention, specifying that data collection and research deemed beneficial for systematic implementation of suicide prevention measures in the country be conducted actively. The law also states that when a suicide occurs, it would be most desirable for the District Police Department to obtain, as part of the routine investigation, detailed personal and background information of the deceased from family members and/or parties concerned, and future cumulative results of such data are expected. Research in some areas in Japan (*e.g.*, Mie and Akita Prefectures) has examined personal characteristics and background factors of suicide cases, obtained in collaboration with police departments, even before the enforcement of the basic law on suicide prevention [11–13]. The database we constructed in the present study contains detailed records of 23 items on the personal characteristics and background factors of all suicide cases that occurred in Okayama Prefecture between the years 1996 and 2003, obtained by the Department of Legal Medicine, Okayama University, in cooperation with the Okayama Prefectural Police. From this database, we extracted a 2-year dataset (of 2002 and 2003) to classify suicide means according to the European study [10] and conduct descriptive analyses on gender and regional differences.

To our knowledge, this is the first study in Japan to use PMR for the examination of gender differences in individual methods of suicide. We examined such differences based on suicides occurring in Okayama, and also assessed the effectiveness of the database that we used for analysis.

Materials and Methods

This study used an anonymized database containing personal informatio—23 items (a total of 182 subitems) capturing the method and location of suicide, age, gender, residential location, and other factors (*e.g.*, occupation, religion, background of suicide, pre-existing illnesses, marital status and family composition, *etc.*)—of all suicide cases that occurred in Okayama Prefecture during an 8-year period (1996 to

2003). The data were obtained by the Department of Legal Medicine, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, in cooperation with the Okayama Prefectural Police. This database was anonymized beforehand and thus could not be used to identify particular individuals. For this study, we extracted a 2-year dataset (of 2002 and 2003) from the database and conducted more detailed coding of each of the subitem data, including open-ended responses. Of the 873 eligible cases, a total of 49 cases with an estimated time of death in or before December 2001, with missing data on gender, age or cause of death, or with a suicide location outside of Okayama Prefecture, were excluded, leaving 824 cases in the final sample for analyses (Table 1 and Fig. 1).

When creating a database for our analysis, we carefully orchestrated the recoding and computerization process so that there was consistency in judgments amongst the coders. Because our analyses were based only on presumably highly objective data such as cause of death and personal attributes, our database had high accuracy, with minimal impact of data misclassification on findings. Our study sample consisted only of suicide cases that were found and estimated to have occurred some time between January 2002 and December 2003. Consequently, our database did not include cases that were found in or after January 2004 but were estimated to have been committed in or before December 2003. However, on the basis of our database records, we estimate that suicides found more than 1 month after they were committed accounted for approximately 3% of all cases. Therefore, their impact on the results of the analysis was minimal.

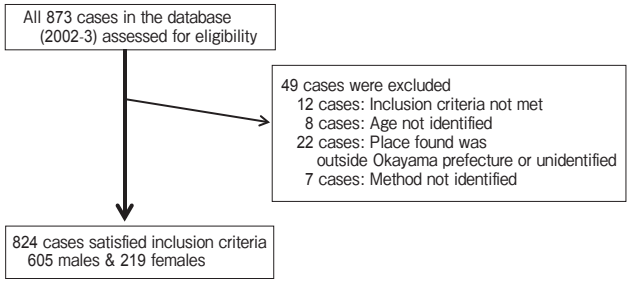


Fig. 1 Participant flowsheet.

To ensure external validity, we compared data on gender and numbers of deaths by suicide methods between the study database and vital statistics for the year 2003. Numbers and rates of suicide deaths by method in each prefecture in 2003 had been reported in "Outlook on Suicide Statistics" [14], a special report of Japan's vital statistics. The total number of suicide cases in Okayama Prefecture estimated to have occurred in 2003 was 423 in our database, compared with 397 reported in the "Outlook" report. With regards to the choice of methods employed, for both men and women, the "Outlook" report reported higher incidences of hanging (277 vs. 249 cases) and gases/vapors (54 vs. 41 cases) than our database, whereas our database found higher incidences of drowning/submersion (27 vs. 12 cases), jumping from a high place (22 vs. 11 cases), and jumping before a moving object (14 vs. 3 cases) than those reported in the "Outlook" report. To make our study results comparable to those obtained in the European study on the EAAD data [10], we first classified suicide methods into the following 8 categories according to the ICD-10 codes for "Causes of Death" (X60–X84): poisoning by drugs (X60–X64), poisoning by other substances

Table 1 Age distribution of 824 cases in Okayama, 2002–2003

Case	Total (N = 824)		Okayama city & Kurashiki city (N = 389)		Other places in Okayama prefecture (N = 435)	
	Male (n = 605, [73.4%])	Female (n = 219, [26.6%])	Male (n = 279, [71.7%])	Female (n = 110, [28.3%])	Male (n = 326, [74.9%])	Female (n = 109, [25.1%])
Age, No. (%), y						
≦24	29 (4.8)	12 (5.5)	14 (5.0)	10 (9.1)	15 (4.6)	2 (1.8)
25–44	171 (28.3)	47 (21.5)	87 (31.2)	28 (25.5)	84 (25.8)	19 (17.4)
45–64	282 (46.6)	87 (39.7)	136 (48.7)	49 (44.5)	146 (44.8)	38 (34.9)
65≦	123 (20.3)	73 (33.3)	42 (15.1)	23 (20.9)	81 (24.8)	50 (45.9)

(X65–X69), hanging (X70), drowning (X71), discharge of firearms (X72–X74), jumping from a high place (X80), jumping before a moving object such as a train or an automobile (X81), and other. The "other" category, which accounted for 7.5% of our study sample, included suicides by self-harm, self-burning, and hypothermia (X75–X79, X82–X84). We then computed male-to-female ratios of the PMR for each suicide method (referred to as "PMR-S" hereafter) and 95% confidence intervals (CIs) by suicide method to contrast our results with those obtained in the European study [10].

Next, to examine whether the choice of suicide methods varied by generation, we stratified the sample into the following age groups: those younger than 25 years of age, those aged 25–44 years, those aged 45–64, and those aged 65 and older, referring to the life-stage classification in the manual of "*Healthy People 21*", which is a health promotion movement in Japan. In addition, to ascertain the age-adjusted PMR-S values, we conducted Mantel-Haenszel tests to test homogeneity across the age groups and computed the Mantel-Haenszel-adjusted PMR-S values as well as the Greenland-Robins 95% CIs.

We further examined if the choice of suicide methods varied by region. Of the total population of 1,950,000 in Okayama Prefecture, a little over half (1,000,000+) are concentrated in Okayama City and Kurashiki City. Similarly, 45.8% of our entire study sample died from a suicide attempt in these 2 cities. Therefore, we compared suicide methods between the following 2 regional groups: "Okayama/Kurashiki" and "other areas of Okayama Prefecture". The regional grouping was based on the location of suicide rather than the deceased's place of residence.

Finally, to examine the trend of time clustering within suicides via carbon monoxide poisoning using charcoal briquets (X66, which were included in "poisoning by other substances"), we constructed the following epidemic curves by the monthly number of cases: "briquet" suicide, poisoning by drugs (X60–X64), hanging (X70), drowning (X71), jumping from a high place (X80), and jumping before a moving object (X81). Because the number of cases for "discharge of firearms" (X72–X74) was only 2 in 2 years, we excluded this category.

With this 2-year dataset, we performed analyses using SPSS ver. 15.0 (SPSS Japan Inc.) and Epi Info 3.5.1.J. (Centers for Disease Control and Prevention: CDC).

Results

As seen in Table 2, the most common suicide methods in our database were hanging for both men (66.0%) and women (54.8%). The PMR-S values (male-to-female ratio for each suicide method) obtained in our analysis were similar to those from the European study; compared with women, men were statistically more likely to choose more lethal methods such as hanging and gas poisoning, but were less likely to choose methods with relatively low lethality such as drug poisoning. The gender difference in the choice of poisoning by other substances was more remarkable in our sample (PMR-S=1.83) than that observed in the European study (PMR-S=1.26).

Table 2 Suicide methods by gender, and proportionate mortality ratio by suicide methods in Okayama (2002–2003) and in EAAD countries (2000–2004/2005)

		Okayama Data Base (2002–2003)								EAAD countries (2000–2004/2005)							
		Male		Female		Total				Male		Female		Total			
	ICD-10	No.	(%)	No.	(%)	No.	(%)	PMR-S	95%CI	No.	(%)	No.	(%)	No.	(%)	PMR-S	95%CI
Poisoning by drugs	X60–64	8	1.3	9	4.1	17	2.1	0.32*	0.13–0.82	10,211	8.6	10,209	24.7	20,420	12.7	0.35*	0.33–0.37
Poisoning by other substances	X65–69	96	15.9	19	8.7	115	14.0	1.83*	1.15–2.92	6,432	5.4	1,766	4.3	8,198	5.1	1.26*	1.12–1.43
Hanging	X70	399	66.0	120	54.8	519	63.0	1.20*	1.05–1.34	64,730	54.3	14,735	35.6	79,465	49.5	1.53*	1.48–1.59
Drowning	X71	23	3.8	29	13.2	52	6.3	0.29*	0.17–0.49	3,598	3.0	3,186	7.7	6,784	4.2	0.39*	0.35–0.44
Firearms	X72–74	2	0.3	0	0.0	2	0.2	Undefined**	Undefined**	11,593	9.7	548	1.3	12,141	7.6	7.22*	5.91–8.82
Jumping	X80	21	3.5	16	7.3	37	4.5	0.48*	0.25–0.89	9,341	7.8	5,977	14.5	15,318	9.5	0.54*	0.50–0.58
Moving object	X81	12	2.0	8	3.7	20	2.4	0.54	0.22–1.31	5,817	4.9	2,162	5.2	7,979	5.0	0.93	0.83–1.04
Other methods		44	7.3	18	8.2	62	7.5	0.88	0.52–1.50	7,400	6.2	2,755	6.7	10,155	6.3	0.94	0.85–1.04
TOTAL		605	100	219	100	824	100			119,122	100	41,338	100	160,460	100		

Abbreviation:
ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th edition; Moving object, ICD-10 X81 Intentional self-harm by jumping or lying before a moving object; PMR-S, Male/Female Proportionate Mortality Ratio for a given suicide method; 95%CI, 95% confidence interval; *, significant difference for 95% confidence interval; Undefined**, not calculable because of null cases.

In terms of the breakdown of suicide methods by age group (Table 3), the most common suicide method in our database was hanging for both men and women in all age groups. Poisoning by other substances was a highly common method among men aged 25–44 and 45–64. In the female sample, drowning was common among the 45–64 and ≥65 age groups, while jumping from a high place was common among the 25–44 and 45–64 age groups. Suicides from poisoning by drugs were most common among the ≤24 and 25–44 age groups for both men and women. There were no significant differences between the crude and Mantel-Haenszel-adjusted PMR-S values (and Greenland-Robins 95% CIs).

In terms of regional variation in the choice of suicide methods (Table 4), there were no significant differences with one exception: compared with the entire sample, the rate of suicides by jumping from a high place was 2.29 times higher in Okayama/Kurashiki, while the rate of drowning was 1.67 times higher in other areas. Comparing the PMR-S data between Okayama/Kurashiki and other areas, there were no significant differences with one exception; women were significantly more likely than men to choose drowning in Okayama/Kurashiki, whereas this gender difference was not seen in other areas of Okayama Prefecture.

When "briquet" suicide cases were examined monthly (Fig. 2), we found a trend of time clustering. This time-clustering pattern, which indicated an epi-

Table 3 Suicide methods by gender, and proportionate mortality rate by suicide methods in Okayama (2002–2003) for 4 age groups, *p* value of Mantel-Haenszel summary test and age-adjusted PMR-S values by the Greenland-Robins method

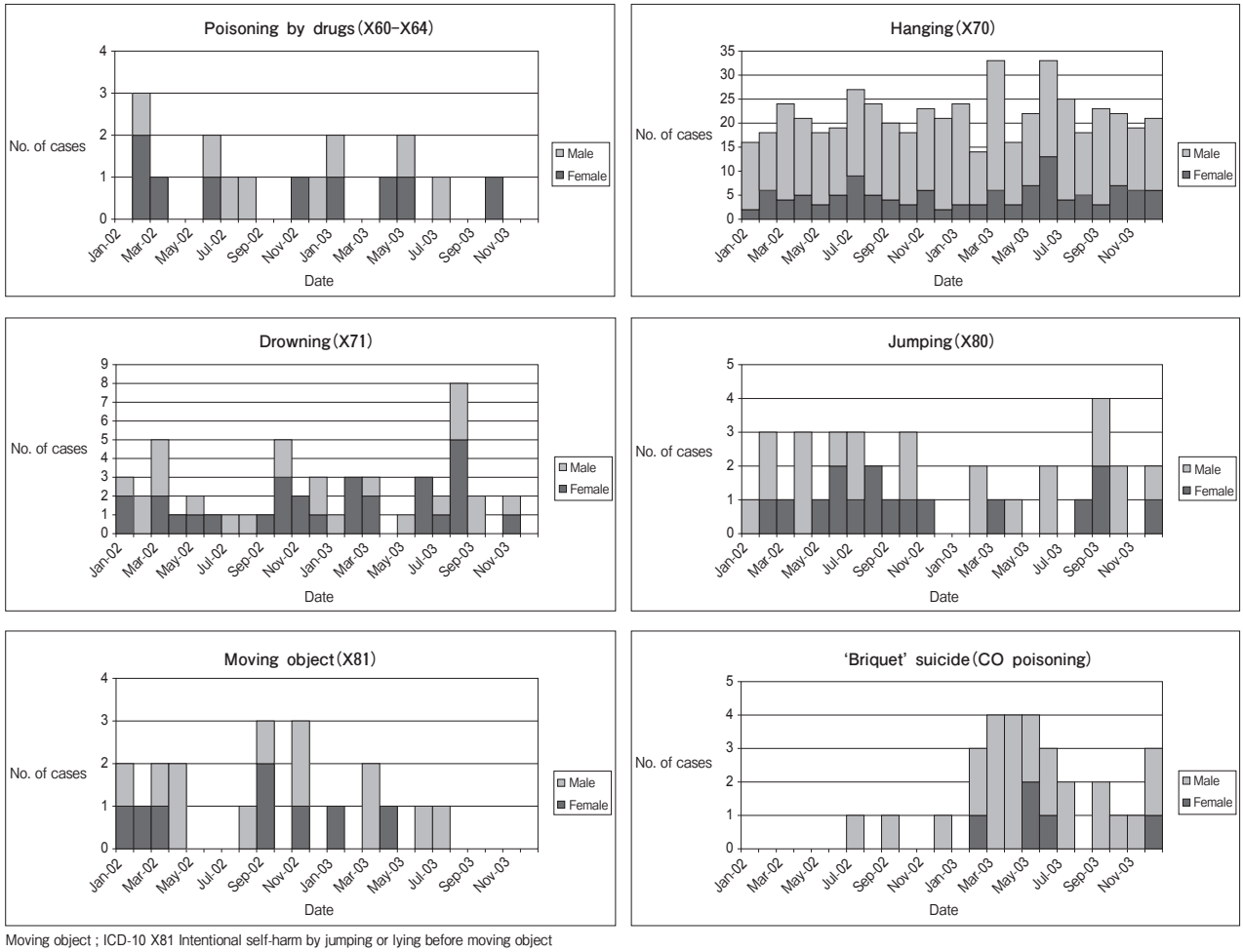
			Okayama Data Base (2002–2003) for 4 age groups										
			Male		Female		Total		Crude		*p* value	Age adjusted PMR-S	G/R confidence limit
	ICD-10	Age group	No.	(% of sex)	No.	(% of sex)	No.	(% of total)	PMR-S	95%CI			
Poisoning by drugs	X60–64	≤24	3	10.3	1	8.3	4	9.8	1.24	0.14–10.8			
		25–44	4	2.3	5	10.6	9	4.1	0.22*	0.06–0.79			
		45–64	1	0.4	2	2.3	3	0.8	0.15	0.01–1.68			
		65≤	0	0.0	1	1.4	1	0.5	Undefined**	Undefined**	0.013	0.29*	0.12–0.73
Poisoning by other substances	X65–69	≤24	3	10.3	0	0.0	3	7.3	Undefined**	Undefined**			
		25–44	36	21.1	5	10.6	41	18.8	1.98	0.82–4.76			
		45–64	48	17.0	9	10.3	57	15.4	1.65	0.84–3.22			
		65≤	9	7.3	5	6.8	14	7.1	1.07	0.37–3.07	0.037	1.67*	1.04–2.68
Hanging	X70	≤24	20	69.0	7	58.3	27	65.9	1.18	0.69–2.02			
		25–44	101	59.1	21	44.7	122	56.0	1.32	0.94–1.86			
		45–64	183	64.9	49	56.3	232	62.9	1.15	0.94–1.41			
		65≤	95	77.2	43	58.9	138	70.4	1.31*	1.06–1.62	<0.001	1.34*	1.16–1.53
Drowning	X71	≤24	0	0.0	1	8.3	1	2.4	Undefined**	Undefined**			
		25–44	4	2.3	4	8.5	8	3.7	0.27	0.07–1.06			
		45–64	13	4.6	10	11.5	23	6.2	0.40*	0.18–0.88			
		65≤	6	4.9	14	19.2	20	10.2	0.25*	0.10–0.63	<0.001	0.30*	0.18–0.52
Firearms	X72–74	≤24	0	0.0	0	0.0	0	0.0	Undefined**	Undefined**			
		25–44	0	0.0	0	0.0	0	0.0	Undefined**	Undefined**			
		45–64	2	0.7	0	0.0	2	0.5	Undefined**	Undefined**			
		65≤	0	0.0	0	0.0	0	0.0	Undefined**	Undefined**	0.962	Undefined**	Undefined**
Jumping	X80	≤24	1	3.4	1	8.3	2	4.9	0.41	0.03–6.09			
		25–44	7	4.1	6	12.8	13	2.3	0.32*	0.11–0.91			
		45–64	10	3.5	7	8.0	17	1.9	0.44	0.17–1.12			
		65≤	3	2.4	2	2.7	5	2.6	0.89	0.15–5.20	0.015	0.44*	0.24–0.82
Moving object	X81	≤24	2	6.9	1	8.3	3	7.3	0.83	0.08–8.29			
		25–44	3	1.8	2	4.3	5	9.2	0.41	0.07–2.40			
		45–64	3	1.1	4	4.6	7	7.6	0.23	0.05–1.01			
		65≤	4	3.3	1	1.4	5	6.6	2.37	0.27–20.8	0.298	0.58	0.25–1.33
Other methods		≤24	0	0.0	1	8.3	1	2.4	Undefined**	Undefined**			
		25–44	16	9.4	4	8.5	20	9.2	1.10	0.39–3.13			
		45–64	22	7.8	6	6.9	28	7.6	1.13	0.47–2.70			
		65≤	6	4.9	7	9.6	13	6.6	0.51	0.18–1.46	0.659	0.85	0.49–1.46
TOTAL		≤24	29	100	12	100	41	100					
		25–44	171	100	47	100	218	100					
		45–64	282	100	87	100	369	100					
		65≤	123	100	73	100	196	100					

ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th edition; Moving object, ICD-10 X81 Intentional self-harm by jumping or lying before a moving object; PMR-S, Male/Female Proportionate Mortality Ratio for a given suicide method; 95%CI, 95% confidence interval; *p* value, Mantel-Haenszel summary chi square test; *, significant difference for 95% confidence interval; Undefined**, not calculable because of null cases; G/R confidence limit, Greenland/Robins confidence limit.

Table 4 Suicide methods by gender, and proportionate mortality ratio by suicide methods in the cities of Okayama and Kurashiki and other locations in Okayama Prefecture (2002–2003)

		Okayama city & Kurashiki city								Other places in Okayama prefecture							
		Male		Female		Total				Male		Female		Total			
	ICD-10	No.	(%)	No.	(%)	No.	(%)	PMR-S	95%CI	No.	(%)	No.	(%)	No.	(%)	PMR-S	95%CI
Poisoning by drugs	X60-64	5	1.8	4	3.6	9	2.3	0.49	0.13-1.80	3	0.9	5	4.6	8	1.8	0.20*	0.05-0.83
Poisoning by other substances	X65-69	39	14.0	9	8.2	48	12.3	1.71	0.86-3.41	57	17.5	10	9.2	67	15.4	1.91*	1.01-3.60
Hanging	X70	178	63.8	55	50.0	233	59.9	1.28*	1.04-1.57	221	67.8	65	59.6	286	65.7	1.14	0.96-1.35
Drowning	X71	17	6.1	14	12.7	31	8.0	0.48*	0.24-0.94	6	1.8	15	13.8	21	4.8	0.13*	0.05-0.34
Firearms	X72-74	1	0.4	0	0.0	1	0.3	Undefined**	Undefined**	1	0.3	0	0.0	1	0.2	Undefined**	Undefined**
Jumping	X80	13	4.7	12	10.9	25	6.4	0.43*	0.20-0.91	8	2.5	4	3.7	12	2.8	0.67	0.21-2.18
Moving object	X81	4	1.4	5	4.5	9	2.3	0.32	0.09-1.15	8	2.5	3	2.8	11	2.5	0.89	0.24-3.30
Other methods		22	7.9	11	10.0	33	8.5	0.79	0.40-1.57	22	6.7	7	6.4	29	6.7	1.05	0.46-2.39
TOTAL		279	100	110	100	389	100			326	100	109	100	435	100		

ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th edition; Moving object, ICD-10 X81 Intentional self-harm by jumping or lying before a moving object; PMR-S, Male/Female Proportionate Mortality Ratio for a given suicide method; 95%CI, 95% confidence interval; *, significant difference for 95% confidence interval; Undefined**, not calculable because of null cases.



Moving object ; ICD-10 X81 Intentional self-harm by jumping or lying before moving object

Fig. 2 Epidemic curves for 6 suicide methods (Poisoning by drugs, Hanging, Drowning, Jumping, Moving Object and Poisoning by "briquet") in 2002–2003.

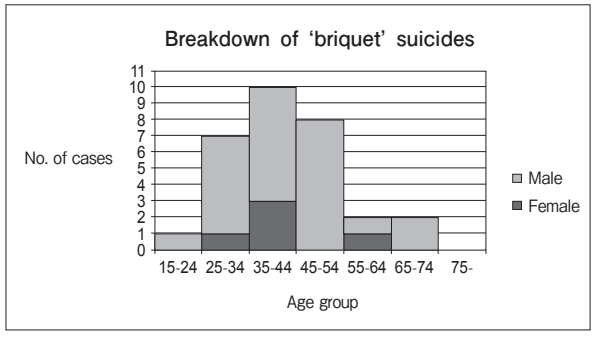


Fig. 3 Bar chart of monthly number of "briquet" suicide cases by gender and age group in 2002–2003.

demic although this needs to be further examined with a time axis covering a much longer time period was unique and was not observed in the other 5 suicide methods we had used for classification in this study. In our 2-year dataset, there were a total of 30 "briquet" suicide cases. Furthermore, Fig. 3 (number of "briquet" suicide cases by gender and age group) reveals a significantly high incidence among men aged 35–44, indicating that this group is especially vulnerable to the risk for cluster suicides.

Discussion

Study database. Using previous European research [10] as a model, we classified causes of death based on the ICD-10 codes for "Intentional Self-Harm (Suicide)" (X60–X84) and conducted a descriptive epidemiological study. Few studies in Japan have examined forensic medical data based on police documents, rather than vital statistics, to ascertain more detailed causes/means of death. Given the availability and accessibility of the same data on all suicide cases occurring in Okayama Prefecture, more progressive research outcomes (*e.g.*, case-control studies) are expected for the future. Therefore, this database seems to provide significant knowledge and insights. However, it is important to recognize the limited generalizability of these findings. That is, because these data were limited only to Okayama, our results should not be applied to all regions of Japan without adjustment.

In addition, the database has 2 limitations. First, because data were only collected for "cases" and the content of the survey questionnaire fundamentally was not tailored to "controls," many of the variables presented a challenge to analysis. Second, during the time period between when the police obtained information from the concerned parties following a suicide and when the police documents were transferred on to the survey questionnaire, which then became our study dataset input into the database, there existed many steps and factors which could have resulted in misclassification of actual information.

The disparities between our database and vital statistics may be attributable to the following factors 〈http://www.ncnp.go.jp/ikiru-hp/toukei.html〉 (National Center of Neurology and Psychiatry, National Institute of Mental Health; Center for Suicide Prevention: Suicide Statistics) Accessed on March 4, 2009]. Statistics on the causes of death in Japan are published in the "Outlook of Suicides" published by the National Police Agency [15] and the aforementioned "Outlook on Suicide Statistics" [14] published by the Ministry of Health, Labour and Welfare (MHLW). While the National Police Agency samples the entire population (including non-citizens), data reported by the MHLW are limited to Japanese citizens residing in Japan. If a death is determined to be a suicide during a routine investigation following the discovery of a body, the National Police Agency counts it as a suicide at that time, whereas the MHLW treats a death as "non-suicidal" when the causality (suicide, homicide, accident, or other causes of death) is unclear and does not count it as a suicide unless a correction is made by the issuer of the death certificate (or in the coroner's report). From an aggregative viewpoint, this is a crucial difference in that the National Police Agency is likely to record a somewhat higher number of suicide deaths than the vital statistics. Furthermore, there may be a disparity in the classification of causes of death between the MHLW and the National Police Agency. Although the former classifies causes of death in accordance with the ICD-10 codes, the latter does so based on the means that directly caused the deaths. Our study data, which were based on where the body was discovered, originated from information available in Okayama Prefectural Police documents, and contained more detailed data on the cause of death than vital statistics; thus they are likely to more closely resemble the National Police Agency data.

Findings on suicide methods and their com-

parison with the existing European data. With regard to the lethality of various suicide methods, Card *et al.* [16] and Spicer *et al.* [9] classify discharge of firearms, drowning/submersion, suffocation/hanging, jumping from a high place, and jumping in front of an oncoming train/vehicle as highly lethal methods, and drug poisoning/overdose and self-harm by burning or stabbing with a sharp object as low-lethality methods. Compared with the suicide methods in the European data [10], our sample revealed more remarkable gender differences for some of the methods, but there were no significant differences in the PMR-S values. Therefore, overall, our results corroborate the trends observed in previous research. In our database, there were far fewer suicide cases of poisoning by drugs for females than in Europe, whereas there were more cases of hanging and drowning. We consider that this was due to a difference in the accessibility to drugs that are highly lethal by over-dose. The gender difference in the rates for poisoning by other substances in this study was more robust, since males in our sample showed a higher rate of suicides via carbon monoxide poisoning using charcoal briquets (25 out of all 30 cases) than females (5 out of all 30 cases) in this category (Fig. 3).

There were an extremely small number of suicides via discharge of firearms in our sample. Suicides using firearms often tower over those with other methods in many of the foreign countries in which the acquisition and possession of firearms are lawful. In Japan, where the acquisition and possession of firearms are prohibited, suicides using firearms are extremely rare, as confirmed by the mere 2 cases in our 2-year dataset. Compared with the European data, our study found a higher rate of suicides by hanging for both men and women. We consider that this was due to the extremely low rate of suicides using firearms, since individuals may have chosen suicide by hanging as an alternative method with high lethality.

As for other methods, suicides by self-burning or self-harm accounted for 5.7% of all cases in our sample. When examined more closely, although there was little gender difference in the rates of suicides by self-burning (3.4% in men, 2.7% in women, 3.3% in all cases), the rates of suicides by self-harm (3.0 in all cases) varied widely between men (2.5%) and women (4.5%). While use of fire, including self-burning, is usually classified as a low-lethality method of suicide [16], our study revealed higher rates of suicide completion by self-harm and self-burning than those reported in studies from other countries [6, 8], indicating a need for further research to investigate the lethality of various suicide methods.

When comparing our results with the EAAD study, we must take into account the differences in age and sex distribution between Okayama and EAAD countries. In this comparison, as a matter of convenience, we assumed that there was no great difference in age distribution. However, in terms of validity, issues of the comparability and transferability of results were not completely settled.

Furthermore, even though the period of our study was included in that of the EAAD study, this comparison had another limitation: We were not able to isolate only 2002–2003 data from the EAAD, which publishes only averaged data for the years 2000–2005. According to the suicide rate changes officially announced by the World Health Organization (WHO) 〈http://www.who.int/mental_health/prevention/suicide/country_reports/en/index.html〉 (Accessed on March 4, 2009), suicide rates in the EAAD countries during 2000–2005 showed constant or downward trends, except Portugal. We therefore assumed that, under these conditions, the suicidal trend in 2002 and 2003 was not so peculiar as to affect the details of the choice of suicide methods when we compared our data with those of the EAAD.

Generational and regional differences in the choice of suicide methods. We examined generational differences in the choice of suicidal means by stratifying the sample into 4 age groups. There were no significant differences between the Mantel-Haenszel-adjusted and crude PMR-S values (Table 2). The Mantel-Haenszel test of homogeneity, however, was significant for poisoning by drugs, poisoning by other substances, hanging, drowning, and jumping from a high place. Our results demonstrate that not only the gender, but also the age of an individual uniquely influences his/her choice of suicidal method. According to reported generational differences in suicidal behavior [17], the older the person, the less violent the choice of suicide methods and the less noticeable the person's suicidal thoughts/intent immediately prior to an act of suicide. In our study sample, the rates of completed suicides via hanging and drown-

ing were higher, for both men and women, in people aged 65 and older than in the other age groups.

In terms of regional differences, we anticipated high rates of suicides via jumping from a high place and jumping before a moving object in the cities of Okayama and Kurashiki, both of which have more high-rise buildings and a better-developed railway network than other areas of Okayama Prefecture. We further expected that the rate of suicides via drowning in the ocean would be necessarily higher in Okayama/Kurashiki because they are located in the southern part of the prefecture along the coast. Further, the prefectural population is concentrated in the southern part of the prefecture. For all these reasons, we did not calculate differences in methods between the two regional groups in this study. Though we adopted such a regional classification because of the limited sample size in this study, the validity of this classification is open to further discussion and it is not necessarily appropriate to interpret our results as a comparison between urban areas and rural areas.

There were a total of 18 cases of suicides by paraquat ingestion in our 2-year dataset, four of which occurred in Okayama/Kurashiki (all males) and 14 (7 men, 7 women) of which occurred in other areas, with no difference in the incidence between the northern (mostly rural) and the southern (comparatively urban) parts of the prefecture. Therefore, the difference in the rate of suicides by paraquat ingestion may be attributable to the accessibility to pesticides (which is greater among people engaged in agriculture) rather than to regional differences. Globally speaking, poisoning by insecticides such as paraquat (X65–X69: poisoning by other substances) is a highly common method of suicide, accounting for approximately one-third of all suicides in the world [3]. This trend is salient in developing countries in Asia and Central and South America, with ingestion of insecticides accounting for 58% of all suicide deaths in agricultural villages of China [4].

Considerations for cluster suicides. Japan first saw a sharp increase in suicides via carbon monoxide poisoning using charcoal briquets around 2003. It is known that the risk of "cluster suicides" (an outbreak of suicides with time and/or location clustering) may increase in response to a suicide committed by a celebrity and/or by detailed reports in the news media on suicide cases with newer methodologies [18]. Especially common among youths, cluster suicides impact teenagers and adults aged 24 and younger at a 2–4 fold rate, compared with other age groups [19, 20]. However, the impact of gender on the rate of cluster suicides is less clear [18]. Further, an outbreak of suicides via hydrogen sulfide poisoning observed in early 2008 has been postulated to show some of the characteristics of cluster suicides. Future studies will be needed to further analyze the nature of such cluster suicides in Japan.

Conclusion. The present findings showed that both gender and age were important factors for the choice of suicide method, and suggested that both gender and age were associated with cluster suicides in Okayama. In addition, our findings suggest that the database constructed and used in this study contains richer information than conventional death statistics and should provide further knowledge and insights for future epidemiological studies.

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