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Abstract

The number of suicide deaths in Japan has continued to be high, and is a pressing social problem. Although the weekly distribution of suicide deaths has been documented, no nationwide analysis has yet been conducted. In the present study, the ratios of the number of suicide deaths per day, by day of the week, and on weekdays relative to holidays were calculated using the data for all suicide deaths recorded in 2003. The suicide deaths recorded on holidays were treated as the reference, and a confidence interval of 95% (95% CI) was used. We calculated the suicide death ratios among men and women of all ages (men:23,396, women:8,713, total:32,109) and also among those of productive age (age:15-64 years, men:18,552, women:5,481, total:24,033). Among men of all ages, the suicide death ratio on Mondays was found to be significantly high at 1.49 (95% CI:1.04-2.14), and the ratios were found to decrease over the course of the week from Monday to Friday. On each weekday, the suicide death ratios among men of productive age were found to be higher than those among men of all ages. Among women, the suicide death ratios on any weekday were found to be higher than 1, but there was no significant difference between the days. Among both men and women, the number of suicide deaths on holidays was lower than that on weekdays. This study revealed that the number of suicide deaths recorded per day on Mondays is 1.5 times higher than that on holidays among men. This suggests that the structure of the work week may possibly influence suicide deaths among men. Future discussions regarding the arrangement and distribution of weekly holidays should be conducted in order to reduce the number of suicide deaths.

KEYWORDS: blue Monday phenomenon, suicide deaths, weekly distribution

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Original Article

Blue Monday Phenomenon among Men: Suicide Deaths in Japan

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The number of suicide deaths in Japan has continued to be high, and is a pressing social problem. Although the weekly distribution of suicide deaths has been documented, no nationwide analysis has yet been conducted. In the present study, the ratios of the number of suicide deaths per day, by day of the week, and on weekdays relative to holidays were calculated using the data for all suicide deaths recorded in 2003. The suicide deaths recorded on holidays were treated as the reference, and a confidence interval of 95% (95% CI) was used. We calculated the suicide death ratios among men and women of all ages (men: 23,396, women: 8,713, total: 32,109) and also among those of productive age (age: 15–64 years, men: 18,552, women: 5,481, total: 24,033). Among men of all ages, the suicide death ratio on Mondays was found to be significantly high at 1.49 (95% CI: 1.04–2.14), and the ratios were found to decrease over the course of the week from Monday to Friday. On each weekday, the suicide death ratios among men of productive age were found to be higher than those among men of all ages. Among women, the suicide death ratios on any weekday were found to be higher than 1, but there was no significant difference between the days. Among both men and women, the number of suicide deaths on holidays was lower than that on weekdays. This study revealed that the number of suicide deaths recorded per day on Mondays is 1.5 times higher than that on holidays among men. This suggests that the structure of the work week may possibly influence suicide deaths among men. Future discussions regarding the arrangement and distribution of weekly holidays should be conducted in order to reduce the number of suicide deaths.

Key words: blue Monday phenomenon, suicide deaths, weekly distribution

The number of suicide deaths in Japan has continued to be abnormally high since the upsurge that was recorded in 1998 (an increase of 35.2% over the previous year) [1, 2]. In 2003, a total of 32,109 suicide deaths were recorded, among which men accounted for 72.9% (23,396) and women, 27.1% (8,713). The number of suicide deaths among men was 2.69 times higher than that among women. Men in their 50s, 40s, and 60s accounted for 27.6%, 17.6%, and 17.4%, respectively, of the suicide deaths among men, which means that these age groups collectively

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accounted for more than 60% of suicide deaths in Japanese men [1]. Suicide deaths among middle-aged older men have an enormous influence on society.

The weekly distribution of suicide deaths has been documented previously [3]. According to a review by Massing *et al.*, 6 studies showed statistically significant differences in the number of suicide deaths on different days of the week in Finland, the USA, and Israel; data from the 1960s and 1970s were used for these studies. In these 6 studies, except for the one conducted in Israel, the number of suicide deaths was found to be highest on Mondays, and in 4 of those 5 studies, the number of suicide deaths was found to be lowest on Saturdays [3]. In a recent study, Johnson *et al.* analyzed the data on all suicide deaths recorded in the UK from 1993 to 2002, and reported that the number of suicide deaths recorded among both men and women was highest on Mondays [4].

Nishi *et al.* analyzed the data for all suicide deaths recorded between 1979 and 1994 in Hokkaido, Japan. Their study indicated that the number of suicide deaths among men was significantly high on Mondays and significantly low on Saturdays, and that the number of suicide deaths among women was lowest on Saturdays [5]. In Japan, several studies have examined suicide deaths in certain prefectures [6–9] and limited areas [10–13]; however, the results showed no significant trends in the weekly distribution of suicide deaths. Furthermore, to date, no nationwide study [4, 14, 15] has investigated the weekly distribution of suicide deaths. In the present study, with the aim of determining trends in the frequency of suicides that might be useful for prevention, we examined both the distribution of suicide deaths by day of the week on the basis of government data and the influence of gender on patterns of suicide distribution by day and age group.

Materials and Methods

Data resource. For this study, we used the data on all suicide deaths recorded in Japan in 2003; these data were specifically calculated by the day of the week and are included in the "5th Statistics Concerning Suicide Deaths, Special Report on Demographic Statistics" (prepared by the Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labour and Welfare) [1].

Since the present study only used published government data, approval from the ethics committee was not required.

Suicide death definition. A suicide death was defined as a death whose underlying cause [16] is classified according to one of the 3-digit codes of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) that signify intentional self-harm, *i.e.*, X60–X84 [17].

Holidays and Mondays. According to Article 1 of the Act on Holidays of Administrative Organs, holidays were defined as Sundays and Saturdays, days stipulated as holidays in the National Holiday Act, and the days from December 29 through January 3. The total number of holidays in 2003 was 122: 50 Sundays, 51 Saturdays, and 21 other holidays, which include the national holidays and the year-end and New Year holidays. After subtracting the 4 national holidays that fell on Mondays (Coming-of-Age Day: Second Monday of January, Marine Day: Third Monday of July, Respect-for-Senior-Citizens Day: Third Monday of September, and National Sports Day: Second Monday of October) and substitute public holidays, the total number of Mondays in 2003 was 44.

Data analyses: calculation of the suicide death ratios and their corresponding 95% confidence intervals (95% CIs). Calculations were performed by gender to determine the suicide death ratios among men and women of all ages (men: 23,396, women: 8,713, total: 32,109) and also among those of productive age (age: 15–64 years, men: 18,552, women: 5,481, total: 24,033). The ratios of the number of suicide deaths per day, by day of the week, and on weekdays to the number of suicide deaths per day on holidays were calculated. The suicide deaths recorded on holidays were treated as the references, and a confidence interval of 95% (95% CI) was used. Epi Info Version 3.3.2 was used for the statistical analysis.

Results

Suicide death ratios among men. The suicide death ratios among men per day on weekdays are shown in Table 1. The ratios on Mondays among males of all ages and those of productive age were found to be significantly high at 1.49 (95% CI: 1.04–

2.14) and 1.55 (95% CI: 1.08–2.23), respectively. These ratios decreased over the course of the week from Monday to Friday. The suicide death ratios among males of productive age were found to be higher than those among males of all ages on any day of the week.

Suicide death ratios among women. The suicide death ratios among women per day on weekdays are shown in Table 2. The suicide death ratios on any weekday among women of all ages and those of productive age were found to be higher than 1, but not significant. The ratio on Mondays was observed to be slightly higher than those on other days of the week, but unlike the ratios among men, those among women showed no significant difference with regard to the day of the week.

Suicide deaths on holidays. The numbers of suicide deaths recorded per day on holidays across all ages and those in individuals of productive age were 54.1 and 41.9 among men, and 22.3 and 13.9 among women, respectively. The number of suicide deaths among men of all ages per day on holidays was the lowest on national holidays and on the year-end and New Year holidays (52.6). The number of suicide deaths among men of productive age was the lowest on Saturdays (40.6), followed by Sundays (43.2).

Discussion

This study revealed that among Japanese men the suicide death ratio on Mondays was significantly higher, approximately 1.5 times, than that on holidays. Our report is the first to reveal a significant difference in suicide death ratios on different days of the week through an analysis of nationwide Japanese data. The review by Massing *et al.* indicated that the number of suicide deaths in various developed countries around the world was significantly high on Monday, the first working day of the week. In Israel, where the first working day of the week is Sunday, the number of suicide deaths was found to be the highest on that day. The above review also indicated that the weekly distributions of suicide deaths were more distinctive among men than among women [3]. The results obtained in the present study were similar to those in this review. Surveys in the USA [14, 18], a study in the UK [4], and a survey in Hokkaido, Japan [5], have also reported similar results. These

Table 1 The suicide death ratios among men per day on weekdays

		All ages				Productive age[d]			
	Days	N[a]	N per day[b]	Ratio	95%CI[c]	N[a]	N per day[b]	Ratio	95%CI[c]
Holidays	122	6,597	54.1	1.00	(reference)	5,117	41.9	1.00	(reference)
Monday	44	3,549	80.7	1.49	1.04－2.14	2,866	65.1	1.55	1.08－2.23
Tuesday	47	3,326	70.8	1.31	0.92－1.86	2,691	57.3	1.37	0.96－1.95
Wednesday	51	3,425	67.2	1.24	0.88－1.75	2,709	53.1	1.27	0.90－1.79
Thursday	51	3,316	65.0	1.20	0.85－1.69	2,636	51.7	1.23	0.88－1.74
Friday	50	3,183	63.7	1.18	0.83－1.66	2,533	50.7	1.21	0.86－1.71

[a]The number of suicide deaths in 2003, [b]The number of suicide deaths per day, [c]95% Confidence Interval, [d]Age: 15–64 years.

Table 2 The suicide death ratios among women per day on weekdays

		All ages				Productive age[d]			
	Days	N[a]	N per day[b]	Ratio	95%CI[c]	N[a]	N per day[b]	Ratio	95%CI[c]
Holidays	122	2,717	22.3	1.00	(reference)	1,697	13.9	1.00	(reference)
Monday	44	1,199	27.3	1.22	0.85－1.77	751	17.1	1.23	0.85－1.78
Tuesday	47	1,166	24.8	1.11	0.78－1.59	736	15.7	1.13	0.79－1.62
Wednesday	51	1,210	23.7	1.07	0.75－1.51	756	14.8	1.07	0.75－1.52
Thursday	51	1,213	23.8	1.07	0.76－1.51	761	14.9	1.07	0.76－1.53
Friday	50	1,208	24.2	1.08	0.77－1.54	780	15.6	1.12	0.79－1.60

[a]The number of suicide deaths in 2003, [b]The number of suicide deaths per day, [c]95% Confidence Interval, [d]Age: 15–64 years.

findings suggest that the "blue Monday phenomenon" is a worldwide phenomenon among men, except in a certain country [19] and race [20]. The ratios of suicide deaths on weekdays among men of productive age were even higher than those among men of all ages. This suggests that the structure of the working week influences suicide deaths among men. In Japan, one suicide that received nationwide attention in the media was that of a 62-year-old former minister of Agriculture, Forestry and Fisheries, Japan, on May 28, 2007, which was a Monday.

Weekly distribution of suicide deaths among men. Among men, the ratios of suicide deaths per day decreased over the course of the week from Monday to Friday. This means that the suicide death ratios among men gradually decrease as the weekend approaches. This result is consistent with that of a study in the UK [4]. A study in Denmark indicated that the number of suicides was small before and during major public holidays ("holiday effect") and larger after major public holidays ("broken-promise effect") [15]. Another study in Germany also reported that the number of suicides was low on holidays and greater on Mondays [3]. In the present study, the ratios of suicide deaths per day on weekdays were calculated by using the number of suicide deaths on holidays as the references, and the results showed that the number of suicides on holidays is lower than those on weekdays. The results of this study also showed that the number of suicides on Fridays was the lowest among weekdays, and similar results have been reported in previous studies [3, 15]. After Mondays, Tuesdays had the second highest ratio of suicide deaths. This observation may be influenced by the fact that Tuesday can be the first working day of the week if the previous Monday was a holiday. Of all holidays, Saturday was the day with the lowest number of suicide deaths per day among men of productive age. This may be because the first working day of the week is further from Saturday than from Sunday.

Suicide deaths among women. Among women, no significant increase was observed in the ratios of suicide deaths per day on weekdays; there was also no clear weekly distribution or difference in the ratios of suicide deaths between women of all ages and those of productive age. Kunii *et al.* analyzed the data on all suicide deaths in Fukushima prefecture in Japan from 1989 through 1995 and reported that although the number of suicide deaths among men tended to be higher on Monday, the number of suicide deaths among women was distributed evenly across all days of the week [7]. These results support the results of our present study. With regard to the age distribution of suicide deaths among women in 2003, women in their 60s, 50s, and 70s accounted for 18.1%, 17.8%, and 15.1%, respectively, of all suicide deaths [1]. The ages of women who committed suicide were higher than those of men. This may explain why the incidences of suicide deaths among women were unlikely to be affected by the structure of the work week, and therefore why there is little difference in the suicide death ratios among the different days of the week. Still, the ratios of suicide deaths among women of all ages and of those of productive age exceeded 1 on weekdays, which indicated that there were fewer suicide deaths on holidays. This trend was also observed among men.

Bias, limitations and further examinations. There may be a misclassification caused by a possible difference between the date when a suicide was committed and that of death, since only the days when suicide deaths occurred were analyzed in this study. This misclassification is nondifferential with regard to the days of the week and gender. Since a nondifferential misclassification leads to underestimation of the results (*i.e.*, toward the null hypothesis), the ratios described in this study may have been underestimated [18, 21]. This means that the actual differences in the ratios may have been greater. In addition, since we analyzed the suicide deaths recorded in 2003, we could not confirm whether the data for years other than 2003 showed similar characteristics [22]. Moreover, time-associated factors such as months and seasons may have affected the results of our analysis. However, because of the limitations of the available data, we were unable to adjust for these factors in this study. Thus, it will be necessary to examine the weekly distribution of suicide deaths by using other methods, for example, comparing the numbers of suicide deaths on working Mondays and Tuesdays after holiday Mondays. This examination was not conducted in the present study because the necessary data were not available in the "5th Statistics Concerning Suicide Deaths, Special Report on Demographic Statistics" [1]. Furthermore, the means of the suicides analyzed in this study were not

limited to a single method, such as train suicides [23–25], and did not include suicidal behavior such as suicide attempts [10, 13, 26, 27]. Weekly distribution of all suicidal behavior, including suicide attempts, should be further examined, and these factors must be addressed in future studies.

Suicide prevention in Japan. Studies in Japan and other countries have clarified that more than 90% of all suicide victims, at the time of committing suicide, were affected by some kind of mental disorder, among which depression was the most closely associated [28, 29]. It has been said that "For a depressive person, the beginning of the working week triggers feeling of personal failure and isolation when the surrounding is occupied by their duties" [25]. Such findings, as well as the findings of the present study, indicate that a desperate person who is obsessed with the idea that there is no alternative other than suicide [28] may feel further cornered on a Monday—the beginning of a new week—and commit suicide. The five-day work week with Saturdays and Sundays as holidays has become prevalent in Japan. However, to reduce the number of suicide deaths by considering the balance between the "holiday effect" and the "broken-promise effect [15]," an alternative arrangement of weekly holidays should be considered in the future, for example, converting Sundays and Wednesdays into holidays.

According to the OECD data for 2004, after Korea and Hungary, Japan had the third highest suicide rate among the OECD member countries [30]. To improve this situation, the Basic Act on Suicide Prevention was introduced in October, 2006. Article 2 of this act stipulates that suicide shall not be treated as a personal issue, but shall be addressed and prevented as a social problem, on the basis of the fact that it has various underlying social factors [22]. It is necessary to inculcate a strong perception in society that committing suicide is not normal and should be avoided. Suicides reflect, and result in, a lack of courage in society [31], and efforts should be made to reduce the number of suicide deaths among men and women due to the blue Monday phenomenon.

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