Characteristics and Risk Factors for Suicide and Deaths Among College Students:
A 23-Year Serial Prevalence Study of Data From 8.2 Million Japanese College Students

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ABSTRACT

Objective: Suicide is a leading cause of death for college students. The aim of this study was to identify risk factors of suicide among college students that could improve university services to help prevent college suicide.

Methods: We conducted a 23-year serial prevalence study of the prevalence and characteristics of death and suicide among 8,262,314 Japanese college students. We analyzed rates of suicide from the 1989 to 1990 academic year through the 2011–2012 academic year and characterized suicide among this population, focusing on students' sex and psychiatric and academic backgrounds to identify risk factors for suicide.

Results: Suicide rates increased throughout the 23 years, and suicide was the leading cause of death every year from 1996 onward. Suicide accounted for 42.4% of all deaths that happened in the 23 years. Male students, medicine majors, students in the final year of their program, and students who completed extra years of schooling or took academic leaves of absence were at higher risk for suicide. Only 16.4% had received an official psychiatric diagnosis and 16.0% had received services through the university health center prior to the suicides.

Conclusions: Results suggest the need for a stronger support system for college students. Areas for improvement could include better advertising of mental health services, student and staff education about suicide risk factors, and mentorship and outreach programs for students in their final year of classes, those majoring in medicine, and those who have taken leaves of absence or failed classes. Accommodations at the administrative level would also be helpful for students who need to retake classes or transfer credit.

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Suicidality in college students is an international problem that has garnered attention from clinicians, schools, families, and public health institutions. In 2009, the Healthy Minds Study[1–3] reported that 7% of US college students have seriously considered suicide, 2% made plans for suicide, and 1% attempted suicide. Another study[4] reported that 6% of undergraduates and 4% of graduate students in the United States reported having seriously considered suicide in the previous 12 months. In late adolescence through young adulthood, youths are expected to rapidly form their identities and are exposed to psychosocial risk factors such as academic stress and relationship troubles, which are associated with psychiatric difficulties and suicide.[5,6] Furthermore, research has shown that the majority of psychiatric illnesses become fully diagnosable before age 24, an age range including a large portion of college students.[7,8] The direct associations between suicide and existing psychiatric diseases including major depressive disorder have been reported in college-aged youths.[9,10] Taken together, this research identifies college students as a population vulnerable to suicide.

The issue of suicidality in college students extends beyond the United States. Japan's national suicide rate has consistently been among the highest in the world, and the number of deaths by suicide reaches approximately 30,000 per year. The high rate of suicide extends to adolescents and youths; suicide is the leading cause of death among Japanese citizens in their teens and twenties.[11] As the substantial risk of suicidality persists internationally, colleges have the unique opportunity to provide care by way of connecting students to mental health resources and integrated academic and social activities. Therefore, there is a need to understand the current state of suicide among college students and to identify characteristics that put students at high risk in order to effectively provide preventative care.

To gain a better understanding of the state of affairs surrounding suicide among college students in non-US countries, we conducted a study examining the data on suicide and other causes of death from a large longitudinal dataset collected on Japanese national university students during the 23 years between the 1989–1990 and 2011–2012 academic years. The sample consisted of a total of 8,262,314 college students and 2,889 deaths, including 1,226 suicides. Through analysis of this rich dataset, we aimed to characterize the suicides of college students regarding their psychiatric, academic, and social backgrounds in order to identify the high-risk groups. By clarifying the characteristics of the individuals, backgrounds, and means of the suicides from this large and longitudinal sample, we hope to support the establishment of preventive measures.

METHODS

Subjects

Subjects were college students attending a Japanese national or public college from 1989 to 2012.

Clinical Points

- Suicide is a leading cause of death for Japanese college students. This study was aimed at identification of risk factors of suicide among college students, which could, in turn, help improve university services to prevent college suicide.

- Men, medical students, and final-year and holdover students were at high risk for suicide. Female medical and dental students had the same risk for suicide as their male counterparts.

- The majority of students who died by suicide did not receive psychiatric diagnoses or university health services, highlighting the low utilization of psychiatric services among students who needed interventions.

Table 1. Total Number of Students and Total Number of Universities Surveyed per Year

Year	Total Students, N	No. of Participating Universities	Total No. of Universities	Percentage of all Universities
1989	291,064	48	95	50.53
1990	295,773	48	95	50.53
1991	313,315	49	95	51.58
1992	324,852	51	95	53.68
1993	338,208	53	95	55.79
1994	336,116	54	95	56.84
1995	393,919	61	95	64.21
1996	399,558	61	95	64.21
1997	399,773	62	95	65.26
1998	383,366	58	95	61.05
1999	422,100	87	95	91.58
2000	381,252	83	95	87.37
2001	378,861	82	95	86.32
2002	375,583	79	95	83.16
2003	371,743	69	83	83.13
2004	351,940	69	83	83.13
2005	338,099	69	83	83.13
2006	380,334	71	83	85.54
2007	370,128	73	82	89.02
2008	352,289	66	82	80.49
2009	372,705	68	82	82.93
2010	361,454	70	82	85.37
2011	329,882	60	82	73.17

Survey

Our group conducted annual surveys of dropouts, holdovers, and deaths among national university students since 1978 (the first survey having been conducted in 1979). National universities were asked in writing to participate in the survey. A questionnaire form was then sent to the appropriate representative and section (the head of the health management center and the staff member in charge of students' numerical statistics) to collect the responses from each university that agreed to participate in the survey. The survey was completed either on a paper version or an electronic version. Anonymous data are reported for the protection of personal information. The surveys were returned to the laboratory of the first author (C.U.) and were stored electronically.

In relation to students' deaths during each academic year beginning on April 30 (which is 1 month after a typical academic year starts in Japan), the following data were collected: sex; age; year of admission; major (faculty and department); status of holdover; notified cause of death; detailed cause of death; method and place of suicide; status of psychiatric diagnosis; status of diagnosis according to the *International Classification of Diseases, Tenth Revision* (*ICD-10*)[12]; and status of involvement of the university health center. The response *psychiatric diagnosis present* means that a medical certificate has been issued by a psychiatrist. Any *ICD-10* diagnosis entered in the questionnaire form returned from each university was based on the opinion of the student's primary physician or the psychiatrist in attendance at the university health center. In some cases, when no diagnosis was entered on the form, the diagnosis was made by the author if the disorder could be diagnosed based on data obtained. The involvement of the university health center was determined based on the student's visit for a mental health consultation. The response *visit present* does not necessarily mean that the visit took place around the time of the suicide.

The survey also included the numerical count of active students as of April 30 of that year. Respondents reported the counts according to sex, year of admission, faculty, and department.

The number of deaths and mortality by cause were calculated from the active student counts and obtained results of the survey items. The suicide rates were also calculated by sex, major, and academic year.

In this study, we report on the serial annual surveys[13] of deaths among the majority of Japanese national university students conducted from 1989 to 2012. Of the 82 national universities, 60 (73.2%) participated in the most recent survey,[14] conducted in 2012. In Japanese colleges, students must declare a major prior to enrolling in college. The humanities and science majors are 4-year programs, and medicine, dentistry, and veterinary medicine majors are 6-year programs. The pharmacy major was a 4-year program until 2006, when it became a 6-year program; therefore, pharmacy major students enrolled between 2006 and 2011 were analyzed as 6-year program students. Medicine, dentistry, veterinary medicine, and pharmacy majors do not require a previous undergraduate degree and are considered college majors rather than specialty schools.

Statistical Analysis

We analyzed the rates of the overall mortality per year as well as types of death from 1989 through 2012. To examine the change in mortality rates over the 23 years that were surveyed, mortality rate was compared among 4 periods: 1989 to 1993, 1994 to 1999, 2000 to 2005, and 2006 to 2011. We analyzed the rate of suicide among this population, with a focus on student sex; academic major; sex difference among each academic major; academic year in each major, including holdover status caused by leave of absence or repeating years; psychiatric diagnosis; methods of suicide; and involvement of university health centers. The data were statistically analyzed by χ^2 test to examine whether a significant difference existed among the groups. Then residual analysis was done to see which group's measured value was significantly higher or lower than the expected value. The Φ coefficient was used for effect size of 2×2 cross tabulation, and Cramer V was used for effect size of other cross tabulation.

Table 2. Number of Surveyed Students and Deaths

Variable	Total (N = 8,262,314)	Per 100,000	Male (n = 5,552,905)	Per 100,000	Female (n = 2,709,409)	Per 100,000
Major, n (%)						
Humanities	3,580,581 (43.34)		1,881,084 (33.88)		1,699,497 (62.73)	
Sciences	4,103,663 (49.67)		3,268,938 (58.87)		834,725 (30.81)	
Medicine	445,809 (5.40)		322,038 (5.80)		123,771 (4.57)	
Dentistry	84,950 (1.03)		55,051 (9.96)		29,899 (1.10)	
Veterinary	40,055 (0.48)		22,550 (4.08)		17,505 (0.65)	
Pharmacy	7,256 (0.09)		3,244 (0.06)		4,012 (0.15)	
Total deaths, n	2,889	34.97	2,370	42.68	519	19.16
Suicide, n	1,226	14.83	992	17.86	234	8.64
Accidental deaths, n	908	10.99	779	14.03	129	4.76
Traffic accidents, n (% of accidental deaths)	618 (68.06)	7.48	521 (66.88)	9.38	97 (75.19)	3.58
Medical illness, n	635	7.69	510	9.18	125	4.61
Murder, n	11	0.13	7	0.13	4	0.15
Unknown, n	109	1.32	82	1.48	27	1.00

Compliance With Ethical Guidelines

This study was approved at the general conference in 1999 to be in compliance with the Ethical Guidelines for Epidemiologic Research issued by the Japanese Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Health, Labor, and Welfare.

RESULTS

Participating Universities and Enrolled Students per Year

Table 1 shows the total number of national universities that participated in the survey and the number of enrolled students in the participating universities of each surveyed year from the 1989–1990 academic year to the 2011–2012 academic year. From the initial survey, which was completed by 48 of the 95 national universities (50.53%), to the most recent survey, which was completed by 60 of 82 national universities (73.17%), our surveys were completed by the majority of national universities in Japan throughout the examined 23 years. The highest number of participating universities reached 87 (91.58%) in 1999. In total, the data of 8,262,314 students were analyzed.
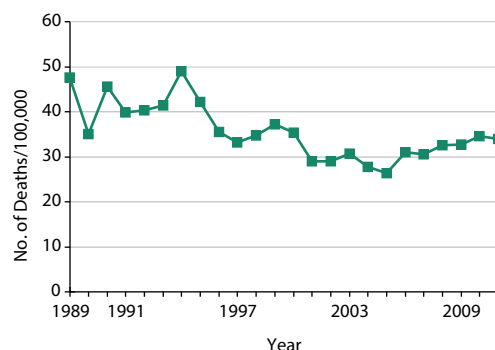
Mortality by All Causes

The total number of deaths was 2,889, including 1,226 suicides (42.4%). The detailed numbers of students by major and deaths by cause are presented in Table 2.
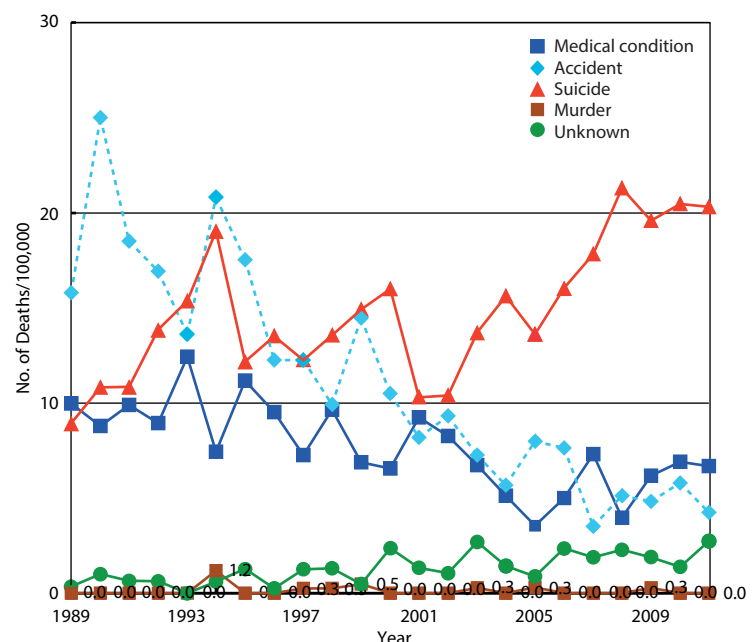
The differences of incidence of deaths by cause were statistically significant ($\chi^2_4 = 1,857.914$, $P < .01$). Ryan's multiple comparison test showed significantly higher incidences of death by suicide and accidents ($P < .01$). Men had higher rates than women for deaths by suicide ($\chi^2_1 = 103.894$, $P < .01$, $\Phi = 0.003$), accidents ($\chi^2_1 = 141.353$, $P < .01$, $\Phi = 0.004$), and medical illness ($\chi^2_1 = 48.844$, $P < .01$, $\Phi = 0.002$). There were no differences in rates of murder between the sexes.

Figure 1. Total Deaths and Changes in Mortality by Cause Over 23 Years

A. Total Deaths[a]
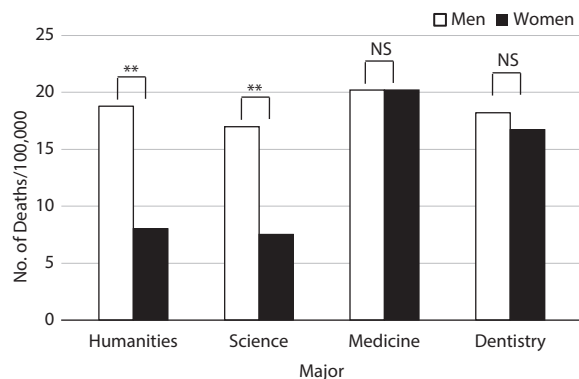

B. Changes in Mortality by Cause[b]

[a]Over the course of 23 years, a decreasing trend in overall mortality was observed.
[b]Over the course of the 23 years, a decreasing trend in accidental deaths and an increase in suicidal deaths were observed.

Table 3. Suicide Among Academic Majors

	Humanities	Sciences	Medicine	Dentistry	Veterinary	Pharmacy
Suicides, n	490*	618	90**	15	10	3
Suicidality per/100,000 students	13.7	15.1	20.2	17.7	25.0	41.3
Male sex, n (%)	354 (72.24)	555 (89.81)	65 (72.22)	10 (66.67)	6 (60)	2 (66.67)
Female sex, n (%)	136 (27.76)	63 (10.19)	25 (27.78)	5 (33.33)	4 (40)	1 (33.33)

*$P < .05$ (significantly low at .05 level).
**$P < .01$ (significantly high at .01 level).

Figure 2. Suicide Rate Between the Sexes Among Each Academic Degree Major Cohort[a]

[a]Suicidality between the sexes among each major cohort was compared by χ^2 test and residual analyses. Men were significantly more likely to die of suicide in both humanities and science majors ($P < .01$). There were no significant differences between the likelihood of suicide between male and female students among medical and dental.
**$P < .01$ (significantly high at .01 level).
Abbreviation: NS = not significant.

Changes in Mortality by Cause Over 23 Years

Figure 1A shows the overall mortality rate per year, and Figure 1B shows mortality by cause per year over the 23 years. A χ^2 test revealed statistically significant differences among the periods ($\chi^2_3 = 41.182$, $P < .01$, Cramer $V = 0.002$). A residual analysis showed that overall mortality was significantly higher for the periods 1989 to 1993 and 1994 to 1999 ($P < .01$) and significantly lower for the period 2006 to 2011 ($P < .01$), indicating a decreasing trend in overall mortality.

A χ^2 test showed statistically significant differences of suicide rates among the periods ($\chi^2_3 = 40.279$, $P < .01$, Cramer $V = 0.002$). A residual analysis showed that the incidence of suicide was significantly lower for the periods 1989 to 1993 and 2000 to 2005 ($P < .01$) and significantly higher for the period 2006 to 2011 ($P < .01$), indicating a recent increase in suicide.

A χ^2 test revealed statistically significant differences of accidental deaths among the periods ($\chi^2_3 = 172.905$, $P < .01$, Cramer $V = 0.004$). A residual analysis showed that the incidence of accidental death was significantly higher for the periods 1989 to 1993 and 1994 to 1999 ($P < .01$) and significantly lower for the periods 2000 to 2005 and 2006 to 2011 ($P < .01$), indicating a decrease in accidental death.

Suicide

Academic majors. Table 3 shows the total number of suicides per academic major. A χ^2 test revealed statistically significant differences among the 6 academic majors ($\chi^2_5 = 18.606$, $P < .01$, Cramer $V = 0.001$). A residual analysis showed that medical students were significantly more likely to die by suicide ($P < .01$), and students majoring in humanities were significantly less likely to die by suicide ($P < .05$).

Sexes among each academic major. As presented in Figure 2, significant differences were found between the male and female suicide rates among humanities ($\chi^2_1 = 75.555$, $P < .01$, $\Phi = 0.004$) and science ($\chi^2_1 = 38.650$, $P < .01$, $\Phi = 0.003$) students. A residual analysis showed that men were significantly more likely to die by suicide in both humanities and science majors ($P < .01$). There were no significant differences between the likelihood of suicide between male and female students among medical and dental students. The data on sex of veterinary and pharmacy students could not be statistically tested due to the small sample size.

Academic year in each major. Among humanities students, a χ^2 test revealed statistically significant differences between academic years ($\chi^2_4 = 325.624$, $P < .01$, Cramer $V = 0.009$). Similarly, among science students, a χ^2 test revealed statistically significant differences among academic years ($\chi^2_4 = 381.839$, $P < .01$, Cramer $V = 0.009$). For both majors, a residual analysis showed that students in their fourth year and those in their fifth year or higher because of repeating academic years or taking leaves of absence were significantly more likely to die by suicide ($P < .01$), and first- and second-year students were significantly less likely to die by suicide ($P < .01$) (Figure 3A). For both majors, the suicide rate was highest in students in their fifth year or higher.

Among medical students, a χ^2 test revealed statistically significant differences among academic years ($\chi^2_6 = 42.783$, $P < .01$, Cramer $V = 0.009$). A residual analysis showed that students in their seventh year or higher because of repeating academic years or taking leaves of absence were significantly more likely to die by suicide ($P < .01$) and first-year students were significantly less likely to die by suicide ($P < .05$) (Figure 3B).
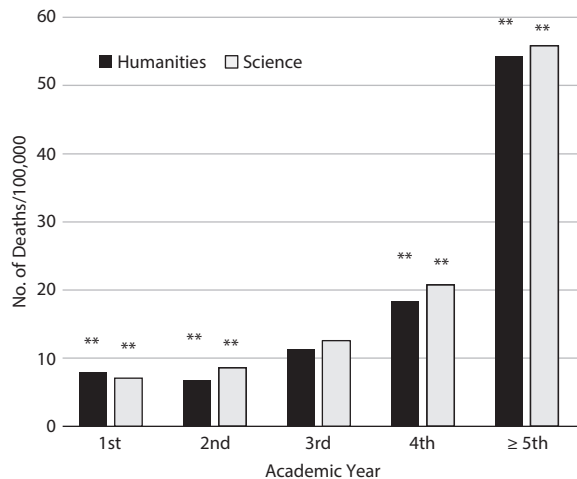
The data on academic years of dentistry, veterinary, and pharmacy students could not be statistically tested due to the presence of cells with no sample.

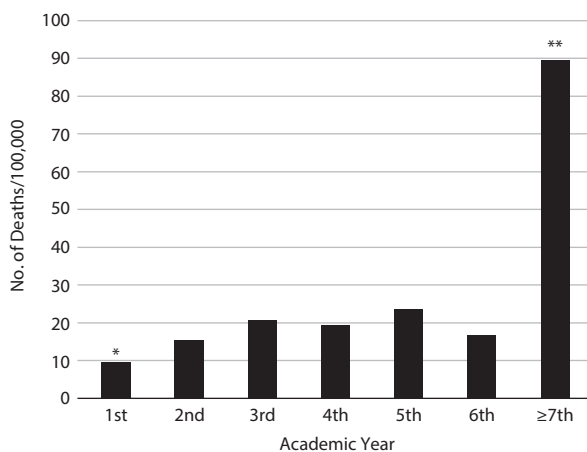*Psychiatric diagnosis.* Of the students who died by suicide, 201 (16.4%) had a psychiatric diagnosis. The

Figure 3. Comparison of Suicide Rate by Academic Year in Humanities and Science (4-year programs) and in Medicine Majors

A. Humanities and Science[a]

B. Medicine[b]

[a]For humanities and science major students, the suicide rate was highest in students in their fifth year or higher. Students in their first or second year were significantly less likely to die by suicide, and those in their fourth or fifth year were significantly more likely to die by suicide.
[b]Among medical students, those who were in their seventh-year or higher were significantly more likely to die by suicide ($P < .01$), and first-year students were significantly less likely to die by suicide ($P < .05$). Because there were zero cells in dentistry, veterinarian medicine, pharmacy majors, χ^2 tests were unable to examine the relationship among academic years in these majors.
*$P < .05$. **$P < .01$.

remaining 1,025 students (83.6%) did not. The categories of psychiatric diagnosis for these 201 students are listed in Table 4. When the rates of each psychiatric diagnostic category were compared, a χ^2 test revealed statistically significant differences among the diagnoses ($\chi^2_9 = 415.667$, $P < .01$). Ryan's multiple comparison test showed a higher rate of mood disorders than other diagnoses ($P < .01$). Psychotic disorders and stress-related disorders ($P < .01$) were the second most common disorders.

Method of suicide. Table 5 lists the number of students who died by suicide and their methods. A χ^2 test revealed statistical differences among the methods of suicide ($\chi^2_{10} = 2,273.197$, $P < .01$). Ryan's multiple comparison test showed that hanging was used significantly more frequently than other methods ($P < .01$). The second most common method was jumping ($P < .01$).

Between male and female students, there were statistically significant differences for hanging ($\chi^2_1 = 5.812$, $P < .05$) and overdose ($\chi^2_1 = 6.469$, $P < .05$). Hanging was significantly more frequent for men than for women ($P < .05$), whereas overdose was significantly more frequent for women than for men ($P < .05$).

Table 4. *ICD-10* Diagnoses Among Suicides

Variable	No. of Students	%
Diagnosis		
F0: Organic, including symptomatic, mental disorders	2	1.00
F1: Mental and behavioral disorders due to psychoactive substance use	1	0.50
F2: Schizophrenia, schizotypal and delusional disorders	53	26.37
F3: Mood (affective) disorders	90	44.78
F4: Neurotic, stress-related and somatoform disorders	37	18.41
F5: Behavioral syndromes associated with physiological disturbances and physical factors	5	2.49
F6: Disorders of adult personality and behavior	9	4.48
F7: Mental retardation	0	0.00
F8: Disorders of psychological development	2	1.00
F90–F98: Behavioral and emotional disorders with onset usually occurring in childhood and adolescence	1	0.50
F99: Unspecified psychiatric disorders	1	0.50
Diagnosed with psychiatric disorders	201	16.39
Undiagnosed with psychiatric disorders	1,025	83.61
Total	1,226	100.0

Table 5. Method of Suicide

Students	Total	Hanging	Jumping	Gas Poisoning	Overdose Ingestion	Railway	Drowning	Electrocution	Cutting	Burning	Other	Unknown
Total												
n	1,226	475	193	103	58	33	29	22	20	14	9	270
%	100	38.74	15.74	8.40	4.73	2.69	2.37	1.79	1.63	1.14	0.73	22.02
Male												
n	992	401	148	84	39	23	19	18	17	13	7	223
%	100	40.42	14.92	8.47	3.93	2.32	1.92	1.81	1.71	1.31	0.71	22.48
Female												
n	234	74	45	19	19	10	10	4	3	1	2	47
%	100	31.62	19.23	8.12	8.12	4.27	4.27	1.71	1.28	0.43	0.85	20.09

Table 6. Involvement of University Health Centers

Variable	Suicides, n	%
Total	1,226	100
Had involvement	196	15.99
Not involved	867	70.72
Unknown	163	13.30

Involvement of university health centers. Table 6 shows the number of students who died by suicide according to the involvement status of university health centers. Of the students who died by suicide, 196 (16%) had involvement with the university health center and 70.7% did not.

DISCUSSION

This study used serial prevalence data from the majority of Japanese national colleges to examine the characteristics and backgrounds of deaths and suicides. Our results documented that while overall mortality and accidental deaths have decreased over the 23 years surveyed, college suicide has increased. Since 1996, suicide has been the leading cause of death among university students. Men were significantly more prone to commit suicide than women, except for students majoring in medicine or dentistry. In medicine and dentistry, women and men were equally likely to commit suicide. Medical students were most vulnerable to suicide among all majors. A higher rate of suicidal death was found in students who were held back, who were in their fifth year or higher in 4-year programs, and who were in their seventh year or higher in 6-year programs, suggesting that holdover students are at increased risk for suicide. Only a minority of the students who committed suicide received a psychiatric diagnosis (the majority of which were mood disorders, psychotic disorders, and stress-related disorders) or had involvement with university health centers, findings that confirm the low utilization of psychiatric care. Hanging and jumping were the most common methods of suicide.

Decreased Deaths by Accidents, Increased Suicide

Our results documented that overall mortality and accidental deaths of college students have decreased, while suicides have increased and have been the leading cause of death since 1996. This is consistent with epidemiologic reports[11,15] published through the Japanese police department on the overall Japanese youth population that document a sharp decline of accidental deaths after 1993 and an increase in suicidal deaths.

Men Have Higher Risk for Suicide Than Women

Our results documented that men were more likely than women to commit suicide. This is consistent with a US study[16] reporting that the suicide rate of female undergraduate students is half the rate of male students. Our previous reports[13,14,17] on leaves of absence, dropouts, and holdovers among Japanese college students also showed that all of these events occurred more frequently for male than for female students. Several factors may contribute to the lower rate of suicide and fewer leaves of absence, dropouts, and holdovers in female students. In a male-dominant society such as Japan, expectations for female students to achieve higher education are not high, and females attend college at approximately 70% the rate of males, thus suggesting that women who reach college are particularly resilient. As another factor, female students receive mental health consultations at a higher rate than male students, allowing females to access help prior to contemplating or attempting suicide.[18,19] This indicates that college mental health programs could focus more outreach efforts on male students.

Suicide in Medical Students: High Suicide Risk, Comparable Risk Between Males and Females, and High Rates Among Holdover Students

The medical student population showed a significantly higher risk for suicide compared to those of other majors. Also, unlike other majors, female students were as prone to suicide as male students were. The high suicide rate among medical students and the equal rates of suicide among male and female students are consistent with the international literature.[20–22]

Across all majors, we found that medical students with a holdover status had the highest rate of suicide. As previously reported in our work[13,14,17] on leaves of absence, dropouts, and holdovers among college students, these 3 events occurred much less frequently for students in 6-year programs (medicine, dentistry, and veterinary medicine majors) than for those in 4-year programs (humanities and science majors). We hypothesized that the lower incidences of leaves of absence, dropouts, and holdovers among the students in the 6-year program majors are due to having a clearer curriculum and an expectation for their professional careers in these majors. While these characteristics are helpful to most students, for the students who have deviated from the originally set course by being held back, the clear curriculum and expectations could present as stressors that lead to psychiatric disturbances. This may be one factor that contributed to our findings of the high suicide rate among holdover students in Japanese medical schools.

High Suicide Rate in Final-Year Students in 4-Year Programs, and Students Who Needed to Repeat Academic Years in All Majors

Our findings confirmed a higher risk for suicide in students in their final year of 4-year programs and in holdover students in all majors. The last year of college comes with increased stress related to preparing oneself for the future, such as completing a graduation thesis and seeking a career path. This may contribute to the high suicide rate and warrants special attention. Our results also suggest that particular attention should be given to holdover students. We have previously reported that holdover students are also at high risk for isolating themselves or lapsing into student apathy.[17,23] Studies from the United Kingdom[24,25] and the United States[16] also suggest higher risks in students

in later academic years. Hence, support for this cohort of students is critical. Establishment of a system that reaches out to students with insufficient credits and the creation of support groups may be beneficial.

Low Rates of Diagnosis and Treatment of Psychiatric Disorders

Our study documented that the most common psychiatric diagnoses observed in the students who died by suicide were mood disorders, followed by psychotic disorders and stress-related disorders. However, 84% of the students who died by suicide were never diagnosed with a psychiatric disorder. While there may be a minority of suicides that were not related to any psychiatric disorder, it is likely that the majority of these students had an undiagnosed psychiatric disorder that did not receive appropriate medical attention. Our results also showed that a university health center was involved with less than 20% of the students who committed suicide. This highlights the low utilization of services among college students who needed intervention and support and suggests the need for improved presence and accessibility of intra-university services.

Methods of Suicide

Our results indicated that hanging, jumping, and gas (such as carbon monoxide and hydrogen sulfide) poisoning, in this order, were the most common methods of suicide among college students. Comparing this result to the method of suicide in other countries, it is noteworthy that the use of firearms is not included in the Japanese college population, likely due to the strict gun control laws in Japan. In the United States, a high rate of gun suicide has been reported, especially among male students,[26] and reduced access to firearms on college campuses has been reported to lead to lower suicide rates in students.[16,27]

The changes in method of suicide over the years observed in our study also appear to reflect the cluster suicides following a suicide that had been portrayed in the media. Our survey showed that in 2005, unlike in previous years, suicide by gas poisoning was the second most common method.[13,14,28] This timing followed a period when Japanese media covered suicides of people who obtained "suicide companions" over the internet and used charcoal briquettes in closed cars to inhale lethal amounts of poisonous gas such as carbon monoxide. Our results show that there was a sharp increase in suicides by gas poisoning following this period of media coverage, indicating that college age youth may be vulnerable to media reports and suggesting that media reports exclude detailed accounts of methods of suicide.

Suggestions for Suicide Prevention in Colleges

Previous works on college suicides have recommended the following prevention actions. Furr et al[29] suggested that in suicide prevention education, priority should be given to (1) warning signs of suicide, (2) supportive actions that should be taken by a student who recognizes the warning signs in others, and (3) information on the presence of an intra-university mental health center. King et al[30] highlight the importance of encouraging students that they can prevent the suicide of a friend by taking action such as advising the friend to seek help. Joffe[31] reported on the efficacy of a university program tested at the University of Illinois. The program, which began in 1984, was based on a mandatory approach in which students who have indicated a suicidal thought or attempted suicide must have 4 consultation or assessment sessions provided by a university psychiatric specialist. After the implementation of the program, the suicide rate dropped by 45.3%.

Taking the above successful interventions in consideration along with our reported results, we have the following suggestions as potential interventions that may reduce the suicide rate among college students.

First, in light of the extremely low rates of health center involvement and psychiatric diagnosis among the students who died by suicide, it is clear that interventions aimed at improving psychoeducation and access to care are necessary. This measure can be implemented by informing students and staff of the presence of university mental health services through websites, brochures, and presentations at new-student orientations; in lectures; and during the new-student physical examination and psychiatric interview upon the students' entry in the college (new-student physical examinations are currently mandatory in Japan, and many universities include a psychiatric interview in this assessment). Additionally, university health centers should be made more accessible to students. Because deep-seated prejudice against psychiatric disorders persists, particularly in Eastern Asian countries such as Japan, it is important that students view the center as a safe place where their privacy will be protected. Architectural designs to eliminate student fears of being seen by other students when entering the health center for psychiatric care may be helpful. Another approach is to provide students with psychoeducation about suicide risk factors and psychiatric disorders so that they can identify these risk factors in themselves and their peers and intervene when necessary.

Second, preventative measures to combat the high risk for suicide among students who need to repeat academic years should be considered. We suggest the establishment of a system that reaches out to students with insufficient credits identified at the administrative level. A large portion of holdover students withdraw from their college environment and often have little connection with others,[17] increasing their risk for student apathy and loneliness, as well as depression and suicide, and making it more difficult for them to take initiative to seek help. Hence, colleges may better help holdover students if they would reach out to them rather than putting on them the burden of seeking care. We advise colleges to establish an administrative method of identifying students who have not registered for necessary classes or have insufficient credits or long absences so that those students can be individually contacted and their parents can be notified. Additionally, it is important for faculty and staff members to be specifically informed of the

high risk of suicide among holdover students. Faculty and staff members who observe the students at close proximity and on a regular basis are in the best position to identify and support high-risk students before administrators or treaters become aware of a problem.

It is also advisable to allocate support staff, such as a facilitator, teaching assistant, or mentor, to the group of holdover students. Academic and social support for this high-risk group could help these students remain connected to the college environment as well as decrease academic stress.

Another approach can be to provide groups for students who need to repeat academic years due to leave of absence or holdovers. Students who take leaves of absence or repeat years in school often report a lack of both strong peer relationships and places on campus where they feel comfortable.[17] Therefore, providing these students with a community and meeting space may reduce their resistance to attending college and can prevent them from withdrawal and isolation.

At a systematic level, increasing the flexibility of the university system to avoid unnecessary holdovers could be helpful. For instance, circumstances where a student is forced to stay in the same academic year only to obtain a single credit that they have failed could be considered unnecessary and impractical. Reducing the stringency of credit transfer rules for students who change majors or transfer schools could also help such students academically as well as psychiatrically. Through these approaches, the number of unnecessary holdover students could be minimized, leading to improved mental health among the students.

Third, we need to give special attention to the high risk of suicide among medical students. The high suicide rate among medical students has been discussed internationally.[20] Along with the influence of mental stress associated with medical school and the medical profession, the knowledge of and accessibility to lethal substances are suggested to affect the high rates of suicide among physicians and medical students.[32] Studies[21,33] have suggested that having individual guidance and a role model from early on in the program could alleviate psychological stress for students. Taking these reports and our results into consideration, we suggest that medical school faculty, administrative staff, and students themselves be educated about the high risk for mental distress and suicide among medical students and that this risk can be ameliorated by appropriate intervention, including psychiatric treatment.

It also may be beneficial for medical schools to provide individual or small-group guidance and mentoring sessions to support the individual development of future physicians. The experience of receiving this personal guidance can also provide additional opportunities for students to learn how to seek help as well as how to be an effective provider.

Limitations

Although the method of collecting surveys through the university mental health centers garnered us access to a large sample, it prevented us from conducting individual assessments of students. The sample consisted of students attending Japanese national universities; hence, our study provides valuable data on a unique population with few previous reports but may limit the generalization of results to the international population. Additionally, the relatively small effect sizes also limit the generalization of our conclusions.

CONCLUSION

Despite these limitations, this study confirmed that suicide is a major concern among college students who received little intervention prior to the event and identified men, medical students, and final-year and holdover students as high-risk groups for suicide, suggesting that preventive efforts should target these groups.

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