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Characteristics of Patients Who Visit the Emergency Department with Self-Inflicted Injury

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During visits to emergency medical facilities, the primary care of and risk identification for individuals who have attempted suicide is considered an important element in suicide prevention. With the ultimate goal of helping to prevent suicide, the aim of the present study was to determine the characteristics of patients with self-inflicted injuries who presented in the emergency department. Patients with self-inflicted injuries who visited 1 of 3 sentinel emergency medical centers from 2007 through 2009 were included in the study. The characteristics, methods, and reasons for suicide attempts were evaluated. Moreover, predictors of severe outcomes were evaluated. A total of 2,996 patients with self-inflicted injuries visited the three centers during a period of 3 yr. The male-to-female suicide ratio was 1:1.38 ($P < 0.001$). The mean age was 41 yr. Poisoning was the most common method of self-inflicted injury (68.7%) among all age groups. Medication was the primary means of injury in the < 50 age group, and the use of agricultural chemicals was the primary means in the ≥ 50 age group. The reasons for attempting suicide varied among the age groups. The predictors of severe outcome are male gender, older age, and not having consumed alcohol.

Key Words: Suicide, Attempted; Suicidal Ideation; Emergencies

INTRODUCTION

The global estimated annual rate of mortality by committing suicide is 14.5 deaths per 100,000 people, which is equivalent to one death every 40 sec (1). Self-inflicted death accounts for 1.5% of all deaths and is the tenth leading cause of death worldwide (2).

Although there is some variability among reported suicide rates, depending on the source of the data, reports published in 2009 by the Organization for Economic Cooperation and Development (OECD) Social Indicators indicated that Korea has the highest suicide rate, with 28.4 deaths per 100,000 people among the member states of the OECD (3). In the past two decades, the suicide rate in Korea has sharply increased. The National Statistical Office of Korea (the Statistics Korea) reported that the suicide rate was 9.20 deaths per 100,000 people in 1988 and had increased to 24.7 deaths per 100,000 people by 2009 (4).

Previous studies regarding suicide have shown that a history of a previous suicide attempt is a key risk factor for a successful suicide (5-7). Owens et al. reported a strong link between self-injury and suicide; in a 9-yr follow-up period, 3%-12% of patients who had previously harmed themselves subsequently committed suicide (8). The study also reported that a suicide attempt is common after self-harm (8). Suicide is important to emergency physicians because of the need for medical treatment, arranging psychiatric services, and subsequent psychiatric intervention. Thus, in emergency medical facilities, the identification and primary care of patients who have made previously attempted suicide are important components of suicide prevention.

The aim of the present study was to determine the characteristics of patients with self-inflicted injuries in the emergency department to help prevent future suicide.

MATERIALS AND METHODS

A cross-sectional, retrospective study was conducted. This study included self-inflicted injury cases of visits to the emergency department (ED) in 3 sentinel hospitals from January 2007 through December 2009. Data from all patients were retrieved from the Korea Center for Disease Control and Prevention (KCDC) and the National Emergency Medical Center (NEMC).

The National Emergency Department Information System (NEDIS) of the NEMC is similar to the National Electronic Injury Surveillance System (NEISS) in the United States (9). The NEDIS is a near real-time system that draws information regarding each patient who visits any 1 of 125 EDs. Core data such as the pa-

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tient's name, age, gender, intentionality, activity at the scene, injury location, and injury mechanism are collected for each patient with an injury.

Since 2006, the KCDC has been conducting in-depth sentinel surveillance in EDs of 6 injury types since 2006, including the following injuries: motor vehicle crashes, brain or vertebral injuries, pre-school child injuries, suicide injuries, falling injuries in the elderly, and poisoning injuries.

The EDs of Ajou University Hospital, Ehwa Women's University Mokdong Hospital, and Chosun University Hospital participate in the in-depth surveillance of suicide, poisoning, and falling injuries. These 3 emergency departments have approximately 25,000-85,000 patients annually, and more than 20% of the entire patient population consists of injury cases. Based on the International Classification of External Causes of Injury (ICECI) (10), a supplementary dataset of self-inflicted injuries was collected and consisted of the mechanism of the injury, the objects/substances that were used to produce the injury, the location of the injury, the intention, and the use of alcohol.

All of the patients were grouped into the following age categories: 19 yr of age and younger, 20 to 29 yr, 30 to 39 yr, 40 to 49 yr, 50 to 59 yr, and 60 yr and older. All of the patients with a self-inflicted injury were interviewed by emergency physicians or psychiatrists who determined whether the patients had a genuine suicidal intention or had merely behaved impulsively. In cases of hemodynamic or mental instability, information regarding the patient was obtained from the family or caregiver. We defined the "severe injury" group as patients who required emergency surgery, who were admitted to the intensive care unit, who were transferred to another hospital for specialized care or who were either dead on arrival or died within 3 days of being admitted to the hospital.

Data regarding the following descriptive characteristics were collected: age, gender, means of transportation to the ED, location of the injury, history of previous suicide attempts, and treatment outcome. The mechanism of the injury, the objects/substances that were used to inflict the injury, the location of the injury, suicide intent, and alcohol consumption were evaluated based on the ICECI (10).

A statistical analysis was conducted using SPSS 18.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive analyses were performed to evaluate the general characteristics of the patients. Student's t-tests were used to analyze the continuous variables, and chi-square tests were used to analyze the categorical variables. A multiple logistic regression analysis was performed to determine the factors that could be considered independent predictors of severe outcomes, and a forward stepwise method by likelihood ratio test was used. We constructed a multivariate model using variables that were selected from the univariate analysis, including gender, alcohol consumption, age, history of previous suicide attempts and injury severity. In all cases, differences with $P < 0.05$ were considered to be significant.

Ethics statement

This study was reviewed and approved by the institutional review board (IRB) of Ajou University Hospital (approval number: AJIRB-MED-MDB-10-110). We did not need to receive informed consent from the participants, as the IRB determined that this study met the requirements for an informed consent waiver.

RESULTS

General characteristics

During 36 months of the study period (January 2007 through December 2009), a total of 125,288 patients with injuries visited the EDs of Ajou University Hospital, Ehwa Women's University Mokdong Hospital, and Chosun University Hospital. Of these patients, 2,996 (2.4%) had a self-inflicted injury. The male-to-female ratio was 1 (1,259 subjects):1.38 (1,737 subjects). The patients ranged in age from 12 to 95 yr, with a mean ± SD age of 41.29 ± 17.61 yr.

Among the 2,996 patients in the study, 2,539 patients (84.7%) were injured in a residential setting, which included their homes or other residential area. Sports and athletic locations were the second-most common area (233 patients, or 7.8%), and this was followed by transportation-related areas such as roadways, sidewalks, cycling areas, or other public highways (157 subjects, or 5.2%).

A total of 1,389 patients (46.4%) arrived at the ED by public emergency medical services, and 630 patients (21.1%) used private medical emergency services. Nine hundred and sixteen patients (30.6%) used individual transportation such as a private car, public transportation or walking.

A total of 1,312 patients (43.8%) had consumed alcohol. A total of 432 patients (14.4%) refused to indicate whether they were under the influence of alcohol.

Two thousand, seven hundred thirty one patients (91.2%) attempted suicide with intention, and 264 patients had induced self-inflicted injuries without real suicidal intention. Of the patients with suicidal intention, 435 patients (16.3%) had a history of a previous suicide attempt. Fifty-seven subjects refused to reply. Two hundred and seventy-two patients had a previous psychiatric consultation (10.0%; Table 1).

Method of self-inflicted injury

Poisoning was the most common method of self-inflicted injury among all of the age groups, accounting for a total of 2,059 patients (68.8%). Medication was the principal method of poisoning among patients over the age of 50 yr, and the use of an agricultural chemical was another primary method in the ≥ 50 yr age group. Cutting or stabbing was the second-most common

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method of self-inflicted injury in the < 60 yr age group, and hanging (45 patients, 9.1%) was the second-most common method in the ≥ 60 yr age group. The third-most common method in the < 20 yr age group was jumping to fall (19 patients, 6.8%; Table 2).

Table 1. The demographic characteristics of the patients with a self-inflicted injury

Parameters	No. (%) (n = 2,996)
Gender	
Female	1,737 (58.0)
Male	1,259 (42.0)
Age (yr)	41.29 ± 17.61*
10-19	279 (9.3)
20-29	597 (19.9)
30-39	658 (22.0)
40-49	626 (20.9)
50-59	341 (11.4)
60+	495 (16.5)
Location of injury	
Residential area	2,539 (84.7)
Sports and athletic locations	233 (7.8)
Transportation areas	157 (5.2)
School and educational areas	20 (0.7)
Industrial or construction areas	12 (0.4)
Other	35 (1.2)
Transportation to Emergency department	
Public emergency medical services	1,389 (46.4)
Private emergency medical services	620 (20.7)
Individual transportation	918 (30.6)
Other	69 (2.3)
Consumption of alcohol†	
Yes	1,312 (51.2)
Suicidal intent	
Yes	2,731 (91.2)
Previous suicide attempts‡	
Yes	435 (16.3)
Once	310 (11.6)
Twice	63 (2.4)
Three times or more	62 (2.3)
Previous psychiatric consult§	
Yes	272 (10.0)

*mean ± SD; †432 subjects refused to mention whether they had consumed alcohol (n = 2,564); ‡Subjects include suicidal attempters, except for those who refused to answer the questions (n = 2,675); §Subjects with the intent to commit suicide were included (n = 2,731).

Reasons for suicide attempts

We evaluated the reasons for attempting suicide in the 2,731 subjects who expressed genuine suicidal intentions. The reasons varied among the age groups. "Conflict with parents" was a major reason for suicide attempt (70 patients, or 28.7%) and "conflict with friends" was the second-most common reason (34 patients, 13.9%) in the < 20 yr age group. In the 20 to 59 yr age group, "Conflict with spouse or lover" was the most common reason, followed by "depression". "Financial problems" was the third most-common reason in the 40 to 59 yr age group. "Medical illness" was the most-common reason in the ≥ 60 yr age group (130 patients, 27.1%; Table 3).

Outcome of injury treatment

Nine hundred and eighty-four patients (32.8%) recovered fully after treatment. One thousand, two hundred and thirty-five patients (41.2%) were admitted to the hospital. Among these admitted patients, 504 patients (16.8%) were admitted to an intensive care unit, and 418 patients (14.0%) were admitted to a general ward without undergoing surgery. Seventy-five subjects underwent an emergency operation. A total of 238 subjects (7.9%) were transferred to another hospital, and 40 patients (1.3%) required special care such as hyperbaric oxygen administration therapy, hemoperfusion or hemodialysis, or an operations performed by a specialists. A total of 207 subjects (6.9%) died either before or after receiving emergency care (Fig. 1).

Predictors of severe outcome

The univariate analysis revealed statistically significant relationships between injury severity and gender ($P < 0.001$), age ($P < 0.001$), alcohol drinking ($P < 0.001$), and a history of a previous suicide attempt ($P = 0.024$; Table 3). In a multivariate logistic analysis, the predictors of a severe outcome were male gender (OR, 1.65; 95% CI, 1.34-2.02), old age (OR, 8.00; 95% CI, 5.10-12.5), and having consumed no alcohol (OR, 1.48; 95% CI, 1.21-1.81; $P < 0.001$; Table 4).

Table 2. Methods of self-inflicted injury by age group

Methods	Age (yr)													
	10-19		20-29		30-39		40-49		50-59		60+		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Poisoning	176	63.1	337	56.4	428	65.1	457	73.1	261	76.5	400	80.9	2,059	68.8
Medicine	143	(81.3)*	258	(76.6)*	296	(69.2)*	277	(60.6)*	111	(42.5)*	123	(30.8)*	1,208	(58.7)*
Pesticides	10	(5.7)*	26	(7.7)*	69	(16.1)*	119	(26.0)*	114	(43.7)*	239	(59.8)*	577	(28.0)*
Corrosive substances	14	(8.0)*	25	(7.4)*	41	(9.6)*	48	(10.5)*	31	(11.9)*	23	(5.8)*	182	(8.8)*
Carbon monoxide	5	(2.8)*	26	(7.7)*	21	(4.9)*	11	(2.4)*	4	(1.5)*	12	(3.0)*	79	(3.8)*
Other poisoning	4	(2.3)*	2	(0.6)*	1	(0.2)*	2	(0.4)*	1	(0.4)*	3	(0.8)*	13	(0.6)*
Cutting/stabbing	60	21.5	158	26.5	133	20.2	85	13.6	31	9.1	22	4.4	489	16.3
Hanging	8	2.9	32	5.4	41	6.2	41	6.5	24	7.0	45	9.1	191	6.4
Jumping	19	6.8	11	1.8	24	3.6	9	1.4	7	2.1	21	4.2	91	3.0
Others	16	5.7	59	9.9	32	4.9	34	5.4	18	5.3	7	1.4	166	5.5
Total	279	100.0	597	100.0	658	100.0	626	100.0	341	100.0	495	100.0	2,996	100.0

*Numbers in parentheses represent the percentage of causes in poisoning patients.

Table 3. Reasons for self-inflicted injury by age group

Reasons	Age (yr)													
	10-19		20-29		30-39		40-49		50-59		60+		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Conflict with														
Spouse or lover	17	7.0	164	32.7	252	42.1	235	40.6	89	27.1	59	12.3	816	29.9
Parents	70	28.7	54	10.8	21	3.5	12	2.1	3	0.9	0	0.0	160	5.9
Children	0	0.0	1	0.2	8	1.3	24	4.1	10	3.0	50	10.4	93	3.4
Friends	34	13.9	13	2.6	3	0.5	4	0.7	0	0.0	2	0.4	56	2.1
Others	7	2.9	14	2.8	17	2.8	14	2.4	15	4.6	16	3.3	83	3.0
Medical illness of														
Oneself	4	1.6	10	2.0	15	2.5	19	3.3	24	7.3	130	27.1	202	7.4
Others	2	0.8	2	0.4	3	0.5	1	0.2	1	0.3	8	1.7	17	0.6
Psychiatric disease														
Depression	24	9.8	59	11.8	84	14.0	62	10.7	39	11.9	62	12.9	330	12.1
Others	9	3.7	33	6.6	37	6.2	35	6.0	17	5.2	18	3.8	149	5.5
Death of someone	0	0.0	5	1.0	8	1.3	7	1.2	6	1.8	11	2.3	37	1.4
Tasks at workplace or school	20	8.2	33	6.6	23	3.8	17	2.9	14	4.3	3	0.6	110	4.0
Financial problems	1	0.4	20	4.0	34	5.7	47	8.1	25	7.6	17	3.5	144	5.3
Others	56	23.0	94	18.7	94	15.7	102	17.6	85	25.9	103	21.5	534	19.6
Total	244	100.0	502	100.0	599	100.0	579	100.0	328	100.0	479	100.0	2731	100.0

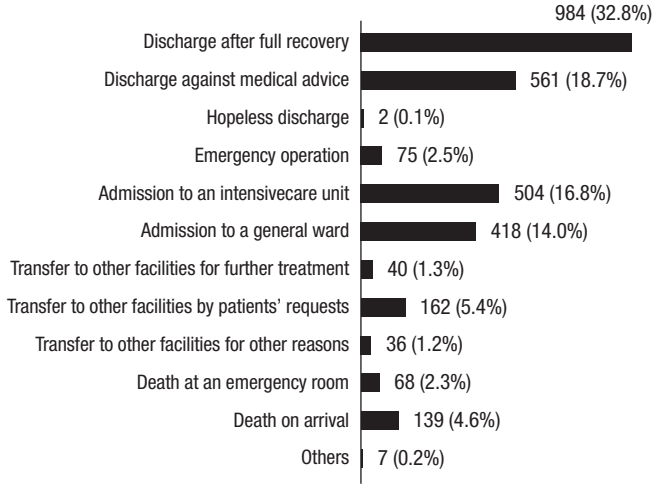

Fig. 1. Summary of treatment outcomes among the patients who visited an emergency department with a self-inflicted injury.

Table 4. Baseline characteristics of the subjects with a severe injury

Parameters	Severity		χ^2	*P* value
	Not severe	Severe		
Gender				
Male	827	432	48.40	< 0.001
Female	1,341	396		
Age				
10-19	242	37	261.11	< 0.001
20-29	489	108		
30-39	517	141		
40-49	472	154		
50-59	224	117		
60+	224	271		
Previous psychiatric consult*				
Yes	1,728	731	1.55	0.233
No	201	71		
Previous suicide attempt†				
Yes	329	106	5.19	0.024
No	1,573	667		
Consumption of alcohol‡				
Yes	939	373	14.55	< 0.001
No	978	274		

*Subjects with the intent to commit suicide were included (n = 2,731); †Subjects include suicide attempters, except for those who refused to answer (n = 2,675); ‡432 subjects refused to indicate whether they had consumed alcohol (n = 2,564).

DISCUSSION

Suicide is a complex problem that is influenced by multiple factors. In studying this problem, it is important to obtain epidemiologic information such as severity, mechanism and cause of the injury, thus facilitating the development of a plan for treatment, rehabilitation, and prevention. Given that the ED is usually the first gateway to a medical facility for a self-inflicted injury patient, the ED may be the best place to obtain the epidemiologic information or characteristics of patients who commit suicide. However, there is a paucity of studies investigating the overall characteristics of suicide attempts based on information from EDs and multicenters that deal with the suicide problem in Korea. Although the present study is a sentinel survey, it is the first multicenter study that was based on the ED evaluation of the characteristics of patients who attempt suicide.

According to the report by the WHO, the male-to-female ratio for suicide ranges from 2:1 to 4:1 in developed countries, and this ratio seems to be increasing (1). Asian countries typically have a much lower male-to-female suicide ratio, and this might also be increasing (11); in China, however, more women die by suicide than men (12). Our results also demonstrate that the rate of suicide attempts among females (58%) was also higher than that in males, which is similar to a previous report in Korea (13). In our study, 265 of the subjects (8.8%) among all of the age groups

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Table 5. Multivariable logistic regression of risk factors for severe injury

Variables	B	S.E.	Wals	OR	95% CI		*P* value
					Inferior	Superior	
Gender, Female	-0.499	0.104	23.025	0.607	0.495	0.744	0.000
Consumption of alcohol	-0.392	0.104	14.146	0.676	0.551	0.829	0.000
Age							
10-19	-2.076	0.228	83.235	0.125	0.08	0.196	0.000
20-29	-1.713	0.171	100.488	0.18	0.129	0.252	0.000
30-39	-1.422	0.155	84.085	0.241	0.178	0.327	0.000
40-49	-1.326	0.153	75.498	0.266	0.197	0.358	0.000
50-59	-0.829	0.169	24.005	0.436	0.313	0.608	0.000
60+			168.648		Reference		
Previous suicide attempt	0.171	0.136	1.575	1.187	0.908	1.55	0.210

exhibited no real suicidal intention, compared with 14.8% in the 20 to 29 age group. This was similar to the 14%-21% rate in adolescent and young-adult populations that was reported in another study (14). We believe that these results indicate that younger patients are more impulsive than older patients.

The methods of committing suicide vary among countries. In the United States, a firearm is the most common method for committing suicide, and the risk of its use is highest among households in which a gun is kept (15). In the rural areas of many developing countries, the ingestion of pesticides is the principal method of committing suicide, and the prevalence of this method is believed to be an easy access to pesticides in developing countries (16). In Japan, which has a high suicide rate, poisoning by drugs is the most common method of committing suicide (17). Because Korea and Japan have heavily controlled firearms, injuries by firearms are extremely rare compared to the United States. In the present study, poisoning by drugs was the most common method in the < 50 yr age group, and poisoning by pesticides was more frequent in the ≥ 50 yr age group. We believe that this result may be due to the characteristics of the hospitals. Three hospitals participated in the present study, and despite location in an urban area, these hospitals manage the poisoned patients from each province. Therefore, we believe that a relatively high number of patients who were poisoned by agricultural chemicals were included in the present study. However, it is possible that this finding reflects the availability of pesticides to elderly individuals who live in rural areas.

The reasons for suicide are multifaceted and complex and have been studied by many researchers. Cavanagh et al. (7) reported that psychiatric disorders are present in approximately 90% of people who commit suicide and represents 47%-74% of the population's risk of suicide in developed countries. However, according to Jeon et al. (18), familial conflict was the most frequent precipitant of suicide attempts in Korea, and our results are consistent with these data. When the reasons for suicide attempts were classified according to age group, "medical illness" was the most common reason in the ≥ 60 yr age group, and "conflict with friends" was the main reason in the < 20 yr age group. This may indicate that the elderly expected a higher quality of life without illness and that most life activities for young people (i.e., < 20 yr old) are mainly based in schools. As in previous studies, depression was a principal factor that was associated with suicide attempts among all age groups (14, 19).

In addition, we identified predictors of a severe outcome following a suicide attempt (Table 5). In the present study, male gender is a predictor amongst others of a severe outcome following suicide attempt. Suicidal behaviors tend to be more prevalent in males, which is in agreement with the results of the previous studies (20, 21). Among the predictors of a severe outcome after a suicide attempt, in agreement with the results of previous studies, suicide-related behaviors tend to be more prevalent among males (20, 21). Conner and Duberstein reported that alcohol dependence was a potential risk factor for suicide (13). However, drinking alcohol resulted in less severe outcomes after attempting suicide. We speculate that the discrepancy between alcohol consumption and injury severity following a suicide attempt originates from the impulsiveness of the person committing suicide. Suicide attempts that are associated with relatively strong impulse owing to the prior alcohol consumption may have been the cause of a less severe outcome. Numerous studies have shown that old age is a predictor for committing suicide (22-25), and the current study confirmed that old age was one of the predictors of a severe outcome. In contrast to previous studies (5-7), a history of a previous suicide attempt was not significantly associated with a severe outcome.

Our study has several limitations. First, because the present study was based on a sentinel survey, a selection bias may influence the outcome of the analysis. Second, despite the fact that suicide attempts were made under various psychiatric conditions, this study found that only a previously confirmed psychiatric disease was a risk factor for suicide. It is indeed impossible for suicide attempters to be thoroughly psychiatrically evaluated upon presentation at the ED. Therefore, the effects of coexisting psychiatric disease on suicide attempts might be underestimated in the present study. Finally, even though Korea has a high suicide rate, it has historically been considered taboo to

seek consultation for a psychiatric crisis. Moreover, patients with a self-inflicted injury tend to mask their suicidal intent. Thus, the suicidal intent of patients may be underestimated.

In conclusion, despite the aforementioned limitations, the present study is the first ED-based multicenter trial to evaluate the characteristics of patients with self-inflicted injuries. Poisoning is the most common method of suicide attempt among all age groups. However, the reasons for self-inflicted injuries vary among the age groups. Male gender, old age, and not having consumed alcohol are predictors of a severe outcome following a suicide attempt. Further studies should be conducted to confirm these results.

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